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THE PRODUCTION OF BRONZE CASTINGS BY THE LOST WAX PROCESS*

By W. Bilz.†

In the accompanying illustration is shown a notable example of artistic bronze castings made by the well-known Cire Perdue or Lost Wax Process. The description as to how the casting of the dog was accomplished is as follows:

The pattern figure of the dog is in two pieces, the base and the animal. The former is unscrewed and both parts are ready for molding. The base is fastened to a plate in the manner of making a glue mold. Modeling clay is cut in slices one-half inch in thickness; then the model or pattern is covered with the same and nicely smoothed off. Plaster of Paris is thoroughly mixed and cast over this clay in order to produce what is called a shell; after the plaster of Paris is hard or set, the shell and the clay from the pattern are removed. The pattern is nicely cleaned and the shell scraped, cleaned and oiled, and set over the pattern in such a way that the space between the model and shell are as uniform as the clay which was laid over the pattern in order to get the same thickness.

Glue is then melted and cast into the shell, which is generally done at night, as it takes from ten to twelve hours to cool in order to produce a good and solid glue mold. In the morning the shell is removed, the glue mold cut according to the model and removed from the model. When this is accomplished, the glue is replaced in the plaster shell in order to keep its shape. The glue mold is then cleaned with French chalk to remove the oil and grease; then washed with a solution of alum water. After this the mold is left to dry in the air; then a preparation of one part of stearine and two parts of kerosene oil is boiled. The mold is then brushed in with this preparation, and is ready for the wax coating.

The wax is prepared as follows: About one part of

EXAMPLES OF BRONZE CASTINGS PRODUCED BY THE LOST WAX PROCESS.

*Paper read at a recent meeting of the New York Section of the Associated Foundry Foremen's Association, held in New York.
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rosin and two parts of beeswax are slowly melted together and a little cinnabar is added, in order to give the wax the reddish color. The wax is then brushed into the glue mold with a camel's hair brush to a thickness of one-sixteenth of an inch, and is chilled down to what is called the freezing point. Now the wax is poured into the glue mold and allowed to stand for a short time; then poured out again. This is done to give it a regular thickness and also a smooth wax casting on the inside. The wax is now allowed to cool and when good and hard the plaster shell is removed in a very careful way, also the glue, so the wax casting may not be destroyed. If this process is handled carefully the wax casting is a true reproduction of the pattern and will require very little retouching.

The same method which is given for the base can also be used for the animal. The two wax castings, base and dog, are now mounted so as to have the casting in one piece, an opening being left somewhere in a place where it will not be seen, in order to cast the core, which is a composition of one part of brick dust and two parts of plaster. Wires are then inserted through the wax casting into this core to act as braces, and the opening is used for carrying off the air and gases, also to clean out the core of the casting. The model is then prepared with gates and risers. The mixture of brick dust and plaster, mentioned above, is then put on with a brush to a thickness of about one-quarter of an inch, after which a wooden box is made and the model set in gates to the bottom, and the composition is cast over the pattern in such a way that there is about a thickness of from four to six inches to the mold.

When this composition is set and hard, it is ready for the annealing process; a mold one cubic foot in thickness takes from twelve to fifteen hours in a steady fire in order to produce a casting clean and free from blow holes. After the mold is taken from the fire it is allowed to cool off so it can be handled with the bare hands. It is then placed in the ground and carefully rammed in with sand, so that only the pour hole is exposed. This is done to hold the mold together to save it from cracking when the metal is cast in.

MODERN TENDENCIES IN ELECTRODEPOSITION.

By Emanuel Blassett, Jr.

The condition of the electroplating industries at the present time may be said to be one of transition with the old empirical methods rapidly passing away. The newly-formed National Electroplaters' Association is bound to exert an influence for the better understanding of the art of metal deposition and a general improvement is sure to follow. That there is considerable poor plating turned out of the shops today no one will deny. Even the United States consuls occasionally call attention, in the Consular Reports, to the inferiority of the electroplate on American goods sold in foreign markets. It is incredible to believe that the American manufacturer deliberately exports goods with an inferior plate and the reason for it must be found in the conditions that prevail in many plating departments of this country. This article deals especially with nickel plating, but the tendencies are the same in all branches of electrodeposition.

The founder of the nickel-plating industry, Dr. Isaac Adams, speaking of the early development of this industry, in a paper read before the American Electrochemical Society in 1906, states: "Notwithstanding the great advances both in theory and practice, in one respect, however, there has been no change. In the chase after solutions from which metals could be practically deposited, the rule of thumb method prevailed and had to prevail. Take, as an example, the search for a practical silver-plating solution. Doubtless, hundreds of silver salts were tried before the rather out-of-the-way double cyanide of silver and potassium was found. In the case of untried metals the experimenter could not safely draw any inferences from similar combinations. There were no rules and few theories to guide. It was a matter of the "cut and try" method of the machinist of that time, and I am afraid it is much the same today."

Many concerns have model and up-to-date equipment with the single exception of the plating plant, which seems to be generally neglected. The manufacturer and superintendent are seldom familiar with the technical side of electroplating, and the foreman plater in many instances is forced to struggle along with inadequate facilities and without the appliances necessary for doing the best work. Then, too, the lack of proper training and the limited knowledge of his trade possessed by the plater is in many cases the reason for an inferior plate on the manufactured article. It is common to find plating rooms without an ammeter and with a voltmeter connected simply to the main conductors of the dynamo, and with no means of knowing the quantity and pressure of the electric current used in the individual baths.

When we take into consideration the rheostat and the various connections through which the current passes from the main conductors to the tank, and no means of knowing accurately the quantity and pressure used in deposition, we do not marvel at the large amount of goods poorly plated that are thrown upon the market. Even in the best-regulated establishments, connections will work loose or become corroded sufficiently to interfere with the passage of the current and unless instruments are at hand to immediately detect these defects, inferior plating is sure to be produced. And then the cry is raised that nickel will rust when the deposit may be so thin as to be almost transparent. A good heavy nickel deposit, produced under proper conditions is one of the best rust-proof coatings for iron and steel that can be found. The writer has seen articles that were heavily plated in use for eight years without the slightest indication of rust. Of course, many platers will say that they are able to tell by the appearance of the deposit when the article is sufficiently plated, but if you were to ask these same gentry how many pennyweights or ounces of nickel there are on a batch of work they are turning out, they would be unable to tell you. In the rush of the day's work it is unsafe to depend solely on the appearance of the deposit and less on the length of time the work has been in the bath. Suitable instruments should be in all plating rooms, indicating the quantity and pressure of the current used in each bath, and this combined with the length of time the work is run will produce the best and most uniform results.

The tendency today, in regard to nickel plating the cheaper grades of work, seems to be to produce a white film and this is considered sufficient for work that is not buffed. Competition and modern demand has forced into use many varieties of mechanical plating apparatus, which are efficient and economical when properly used, but are unfortunately the cause of much inferior work. Work plated by the barrel method is seldom run long enough to insure a good deposit. What is the result? The constant rusting of nickeled goods and widespread dissatisfaction with nickel as a protective coating for iron and steel. Of what use is a thin transparent deposit of nickel on steel and iron? It serves no purpose whatever other

than to give the articles a whitish appearance. It will not protect the surface of the iron or steel from the corrosive action of the atmosphere which nickel is popularly supposed to do.

It is not the purpose of the writer to antagonize the use of the plating barrel, for he recognizes that they are a necessary equipment in all plating plants handling small articles; but the fact remains that we are not all educated in the proper use of them. The writer has known platers to run steel work by the barrel method for one-half hour. The plated article looked a shade whiter it is true, but it certainly did not, except to the slightest extent, protect the goods from rusting. Two hours should not be considered too long to run work in the plating barrel, employing of course, the right amperage and voltage that conforms best to local conditions. For plating by the barrel method, a pressure of from six to twelve volts and on an average of sixty amperes is employed, depending on the quantity and nature of the work.

In regard to the better grades of work that is usually buffed, the conditions under which the plating is carried on in some shops are deplorable, and to speak plainly, ludicrous. Very few shops indeed, have the means of ascertaining the weight of nickel deposited per batch of work turned out. It is true that many manufacturers insist on a close inspection of the deposit and reject all work that is cut through; but this does not go far enough to insure a good plate. A skillful buffer is able to buff brightly thin deposits without cutting through, and for that reason the weight of nickel deposits should be known when the work leaves the plating department. If the weight of the deposit is known and produced uniformly from day to day, less cutting through of the deposit will result, with little or no work to be refinished. This little extra attention to details will prove very economical.

In conclusion the writer may be permitted to quote from a recent work on electrochemistry by Bertram Blount, who has this to say in regard to nickel plating: "It is curious to note that old as is the art of electroplating, there has been scarcely any attempt to study systematically the conditions necessary to effect a satisfactory deposition. The whole art is empirical—witness the number of quaint recipes." This has been true until recently, but the tendency today in the electroplating industry, as in all electrochemical industries, is toward scientific investigation, and the application of certain definite rules to govern electrolysis, which will bring the art of metal deposition to a high state of development.

BUSINESS SYSTEM IN THE PRODUCTION, HANDLING AND MANUFACTURE OF PLUMBING, STEAM, GAS AND WATER WORKS BRASS GOODS.

By P. W. Blair.

The first thing now in a factory manufacturing brass goods is to learn the cost of production of the different articles that are manufactured, and to procure an estimate that is accurate, the plant must be systematic in the handling and manufacture of its goods. There has been a great advance both in the securing of costs and in manufacture within the past five years by the different manufacturers with the able assistance of the Brass Manufacturers Association and good results have been derived from same; as an illustration the writer of this article is connected with a manufacturing company in the manufacture of brass goods which has expended fifty-thousand dollars in the past two years for the installation of a system to determine the cost of manufacture and systematize the manufacturing end of their business, and the same is not completed as yet.

The factory with an increased efficiency will get more of the business than the one with low efficiency, as it will be able to ship its orders on time, and not cause any delays in shipment or excuse to make to its customers. The firm that can make prompt shipments is the one that is going to secure the largest portion of the business that is to be had. Service is the strongest selling point in any business. Goods being equal, service demands a premium in many instances which means promptness and reliability. The warehouse department should base their stock orders to factory on their past year's sales, and at all times carry a maximum and minimum amount of stock of standard goods.

FIG. 1. STEEL CORE TRAYS.

Separate orders should be issued for all special goods and express orders. Regular orders which come from office to factory should be stock orders, with a drum list issued every day specifying goods required to fill orders and low on stock, which would enable the factory to push goods that were holding orders or low on stock, always giving express orders preference. Care and judgment should be used by the warehouse stock department in issuing their orders to factory and base their orders on the past six months' sales, so that goods can be worked through the different departments in large quantities, as the larger the quantities you manufacture the more will the cost of production be reduced. As an illustration, if you proceed to manufacture 100 ¾-in. globe valves and ascertain cost of same, and then manufacture 500 of the same kind you will find that it cuts the costs 10 per cent. on the 500 lot.

The most systematic manner to make a success from beginning to end is to work as far as possible under the card index system, and I will endeavor to explain in this article how this can be applied in each department. First we will start with the core room and foundry, each core box has a number stamped on it and there is a pigeon hole to file the core box in when not in use, with the number to correspond. All patterns loose gated or plate work are numbered and bins or racks for receiving them when not in use are furnished. Each department should be furnished with a catalog of all the goods manufactured. Castings stockkeeper issues the order to the foundry for 500 ¾ in. D-605 Bodies, 600 ¾ in. D-605

FIG. 2. ANOTHER STYLE OF CORE TRAY.

Stems. The person in charge goes to the index and secures the number of the bin, the core box and pattern are located in from this card under bodies and sizes by turning to card marked ¾ in. 605. The stem pattern is found in the same manner under stems, size ¾ in. D-605. He then issues order to the core room for his amount of cores, and turns the plates of pattern over to the foundry

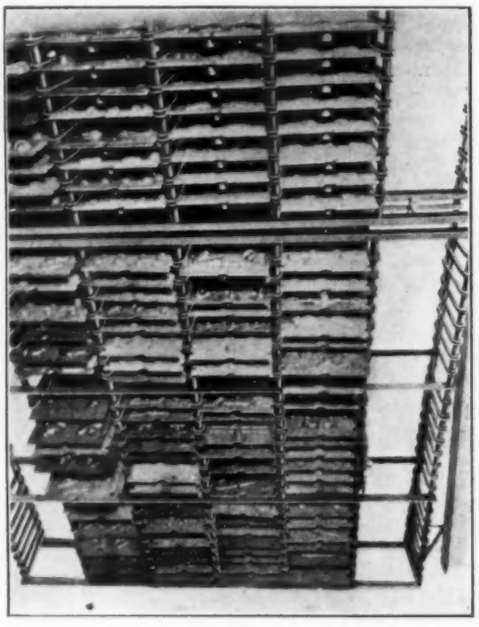


FIG. 3. RACK FOR HOLDING PLATES OR GATED PATTERNS.

foreman taking his receipt for same. All patterns and core boxes after being used and returned to pattern storage should be thoroughly examined before being put back in bins so when they are to be used again it will cause no delays for repairs. There should be 10 per cent. allowed for spoilage and defective castings on all core work castings. That per cent. should govern same from foundry to manufactured goods; if there is a greater loss

FIG. 4. FOUR DECK TRUCK.

than that amount thorough investigation should be made to locate the cause.

Cut No. 1 shows a core tray made entirely of steel, triple folded on each side with the top lids bent forward so that they can be stacked one upon the other. This tray is manufactured No. 16 gauge, with a length of 18 ins., width 12 ins. and height 3½ ins.

Cut No. 2 is a tray made of sheet steel reinforced with two bands 1½ ins. x 1⅛ ins., riveted to the bottom and sides and will stack the same as No. 1, which makes them great floor space savers.

Cut No. 3 is an illustration of racks for holding plates

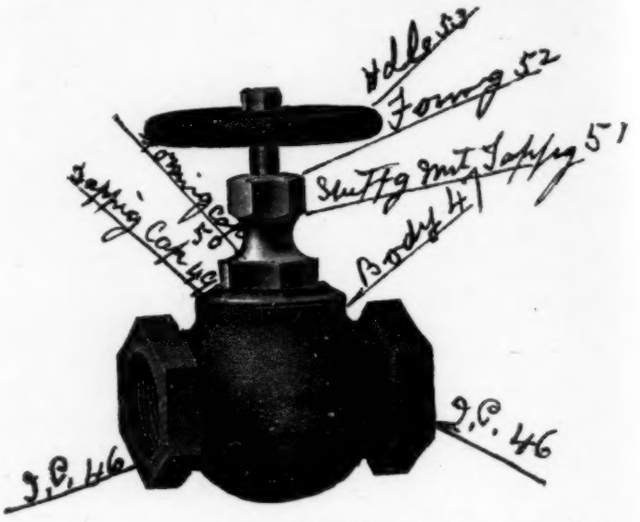


FIG. 5. A GLOBE VALVE SHOWING HOW THE OPERATIONS ARE NUMBERED.

or gated patterns and is a great space saver and systematizer.

The factory rough stock casting department should carry a maximum and minimum amount of all castings based on the past year's output, which would enable them to supply the finishing department with all castings on their first requisition for same. All castings after being taken out of the rattler should be placed in boxes, each style of castings in separate boxes, and delivered to the casting stock department, where they should be placed in racks in boxes and a card index system kept by the rough casting stockkeeper of all castings in his department, no one to accept or check in or out castings without his

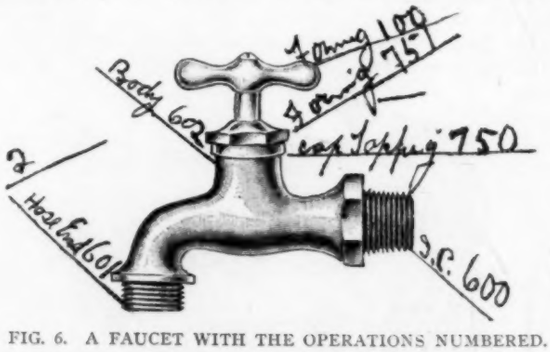


FIG. 6. A FAUCET WITH THE OPERATIONS NUMBERED.

permission, which allows him, by referring to his card index, to inform anyone the amount of rough stock or semi-finished castings he has on hand at any time.

The most convenient boxes for handling rough and semi-finished castings should be made out of ⅞-in. wood and the measurements should be, length 16 ins., width 8 ins., depth 10 ins., which makes them convenient for handling by anyone when filled with castings. There should always be a surplus of empty boxes on hand in each department to allow the workmen to work from one box to the other. Cut No. 4 shows a handy truck for

moving boxes with a capacity of 700 pounds. All lathes and different machines should have movable stand 20 ins. x 28 ins., with a drawer which will enable the operator to place his castings on same—one box filled, the other empty, and working from one box to the other. All castings rough and finished should be kept clear on the floor from around the machines as there is a tendency to throw machines out of line by having castings piled in quantities around them. Castings should not be thrown into the boxes, as it has a tendency of bruising and spoiling the appearance of the goods, either rough or finished.

All lathes and machines should be numbered in rotation and equipped with an electric push button bell connected to an annunciator, which allows the operator to call a tool boy or the foreman without leaving his machine. This enables them to have all tools or castings ready for him to go on with his next job by notifying the foreman fifteen minutes before he is done with the one he is working on. All workmen on machines should be equipped with the following tools, at their own expense: One hammer, one monkey wrench, two oil stones, one 6-in. steel scale, one pair of outside calipers, one pair of inside calipers, one 10-in. screwdriver, one 6-in. screwdriver, one pair pliers, one hacksack frame with two blades for brass. The firm to furnish tool box and all other necessary tools and a complete record of same to be kept. The employee is to be held responsible for all tools that are the property of the firm for their return in good condition.

The card index system can be used in the finishing department to receive tools from tool storage to apply on the different operations on castings the same as in the foundry. On the different operations can be numbered similar to this, ¾-B-605 Globe Valve Fin. I. P. Ends No. 46, Body End 47, Stem 48, Bonnet or Cap Tapping 49, Forming 50, Stuffing Nut Tapping 51, Forming 52, Handles 53, which gives you the full operation complete on the article. See cuts No. 5 and 6 of two of the leading articles manufactured in this line of goods as an illustration. All the foreman does is to send size of the article and number of the operation, also number of machine to the tool storage and he gets the same from a card in the index system.

The tool keeper places an order for each tool taken out of tool storage that goes to the machine. When the tool is returned the orders are taken out and destroyed. By placing an order for every tool taken out you can always locate same when required by any other workman. All tools should be thoroughly examined to see if they are in good condition before being put back in their proper place in tool storage in order to avoid any unnecessary delay when they would be put in again. All work after being polished should be put on racks to be assembled and tested before buffing so that they do not become marked or damaged in any manner when going through the different operations in buffing and plating department.

Trucks can be made up to load the racks on with a capacity of 100 to 150 complete articles to a load or an

FIG. 7. FLAT STACKING TRAY.

average of thirty-six to the tray. Cut No. 7 shows a flat stacking tray fitted with a steel separator for holding in position fine pieces of machined brass castings. It keeps them from getting scratched. This tray can be stacked one on top of the other as high as the ceiling and still be solid. They are great space savers and a convenient article to have in any brass shop. Some reader of this article may think that this system will not work or could not be applied in his shop, as I have got along many years without any fixed system of manufacture or cost record and went about it in a hit and miss manner. It is therefore no surprise that so many firms in the manufacture of this line of goods have gone into the receivers' hands in the past five years. This is due to attempting to do a permanent and profitable business on anything but a legitimate profit and from the effects of having no system in production or in keeping the actual cost of manufacture.

PLATERS' WRINKLES

SOME HELPFUL HINTS FOR PLATERS, SUPPLEMENTAL TO THOSE PUBLISHED DURING THE PAST THREE YEARS.

BY CHARLES H. PROCTOR.

The burnt brass effect upon brass plated antique iron or other metals is produced by rubbing down with sea sand and water, then lacquering in the usual manner, then mix up burnt sienna or burnt umber with a little turpentine, linseed oil and copal varnish. The articles should dry for a short time, then be wiped out irregular to give the appearance of scouring away the burnt surface.

In producing what used to be termed the Butler or Etruscan silver finish, with a dead black background, the same methods can be pursued as in producing Colonial or brush brass finish. Deaden the surface with the aid of a soft brass wire scratch-brush, pumice stone and water. Dry out and lacquer. Then paint in dead black (Japalac), which should dry for five or ten minutes; then the high lights should be relieved in the usual manner, using a mixture of equal parts of boiled linseed oil and turpentine and finish with clean rags.

In the same manner the old English antique brass can be produced upon brass or brass plated goods, or rich effects upon copper or copper plated goods.

Imitation verde tones or any contrasting color can be produced by mixing dry colors in turpentine, using a little turpentine copal varnish, and mixing to the proper consistency and applying as stated before. These colors give opaque tones, providing too much varnish is not used. Then dry in fifteen minutes. All metals should be lacqured before applying. The colors dry into the lacquered surface, giving permanent results.

Sulphide of barium should be used in preference to sulphuret of potassium in producing rich shades of brown upon copper or copper plated articles. The same methods are pursued as in using sulphuret of potassium.

A NOVEL METHOD OF DETECTING MINERAL OIL AND RESIN OIL IN OTHER OILS*

By Alexander E. Outerbridge, Jr.

When examined by reflected light, hydrocarbon oils (improperly named "mineral" oils), whether crude or partially refined, show a peculiar greenish tinge commonly called "bloom." When examined by transmitted light the bloom disappears and the true color of the oil is seen. This color ranges from dark red or mahogany tint through various shades of orange and yellow up to "water white," according to the degree of refinement. Resin oil possesses the same peculiar characteristics, except that the color of the bloom is pure blue. Its chemical composition is so nearly like that of a hydrocarbon oil that these resemblances appear to me to be more than accidental coincidences and suggest the possibility of a common origin between so-called mineral oil and resin oil. This speculation, however, is not germane to our topic, which has to do strictly with a new practical application of that property commonly called bloom to the instantaneous detection of adulteration of vegetable or animal oils with hydrocarbon oils.

Doubtless everyone has noticed the bloom in mineral oils and wondered perhaps as to the cause of this singular greenish appearance, which is especially noticeable in crude oil and in heavy lubricating oils. Bloom is merely a popular name for a remarkable property, possessed by a number of substances, the scientific name for which is "fluorescence," and the question may now be properly asked, "What is fluorescence?"

In simple non-technical words, fluorescence is a property inherent in some substances of becoming self-luminous while exposed to certain rays of light known as "ultra-violet" or "actinic" rays. These rays are always found in sunlight and in some forms of electric light. If a beam of white light from the sun or from an arc-light be passed through a prism (preferably for some purposes made of quartz) it is separated into a broad band of prismatic colors. Such a beam may be likened for illustration to a closed fan; after passing through the prism the fan is opened, and it is seen that each fan-stick has a different color, namely, red, orange, yellow, green, blue, indigo, and violet. Beyond the red, on one side of the prismatic band, and beyond the violet on the other, are many rays which are visible to the eye; but some substances when placed in the path of these invisible rays become luminous or fluorescent, the color of the fluorescence being characteristic of the substance, some showing green, some blue, some yellow, some purple, some white, and others various intermediate tints.

In the course of my investigations I found that the greenish bloom or fluorescence of mineral oil and the blue bloom of resin oil noticeable in daylight can be enormously intensified or magnified, perhaps a thousand fold, under certain conditions to be described herein, so that, if a single drop of mineral oil be placed in a vessel containing a hundred or even a thousand drops of pure linseed oil, or any other non-fluorescent oil, its presence may be instantly detected by the greenish fluorescence which it imparts to the whole of the oil. The same is true of resin oil, which gives blue fluorescence. The utilization of this observation for practical purposes of detecting adulterations is the gist of this paper.

By increasing the proportion of either adulterant the intensity of the fluorescence imparted to the naturally non-fluorescent oil is correspondingly increased; and, by preparing standard samples of any non-fluorescent oil containing one-tenth, one, two, three per cent., and upwards, of mineral or resin oil, in clear glass test-tubes placed in a suitable frame against a dark background, each showing readily and unmistakably the increasing proportions of the adulterant under a light giving ultra-violet rays, a "fluorescent scale" has been established, somewhat similar to the well-known carbon color scale used in steel foundry laboratories for quickly determining, by color comparison, the proportion of carbon in an acid solution of steel.

By comparing a sample of non-fluorescent oil which has been adulterated with mineral oil or resin oil with these standards, the proportion of such adulteration may often be accurately stated in a moment by any one. I use the word "often" in connection with the quantitative determination advisedly, in order to allow for some modifications, to be explained further on; but I am prepared to unhesitatingly make the broad assertion without fear of contradiction that there is no method known by which the presence of either mineral or resin oil in any non-fluorescent oil in small or large amount can be so disguised as to be undetectable instantly by this method, and this certainly is an interesting and important fact of considerable practical value to consumers of costly oils.

It is stated in text books on oil analyses, and also in elaborate works on oil refining, that methods of chemical treatment of mineral oil have been discovered to "de-bloom" mineral oil so that it can be used with impunity, so far as the bloom is concerned, as an adulterant for expensive vegetable and animal oils, and I learned that there is a very large trade in de-bloomed oils for this purpose. It was, of course, at once evident to me that my new process would be totally incapable of detecting adulteration of non-fluorescent oils with mineral oil when deprived of all bloom or fluorescence. Accordingly, I obtained samples of de-bloomed oils of different grades and colors. These samples are free from bloom in bright sunlight or ordinary diffused daylight, or in the light from an ordinary electric arc, but when subjected to the kind of light which I shall presently describe they all became highly fluorescent. When I stated to a certain refining company that their samples of de-bloomed oil were far from bloomless, they expressed the greatest astonishment; they said there must have been some inexplicable error in selecting the samples, and that they would forward new samples guaranteed to be "absolutely bloomless." The new bottles not only had the printed "de-bloomed" labels, but they had other labels with the word "bloomless" written on them. These samples were precisely the same as the others, all showing the same fluorescence under the ultra-violet light illumination.

I then prepared a new series of standards for comparison, made with this so-called bloomless oil, so that it is possible to readily state the fact and even the proportion of adulteration with de-bloomed mineral oil in any specimen of non-fluorescent oil mixed with such de-bloomed mineral oil. I anticipate that this positive statement, now made for the first time, will cause some consternation among makers of de-bloomed mineral oil.

*From a paper read at Atlantic City meeting of American Society for Testing Materials held June 27-July 1, 1911.

If both mineral oil and resin oil be used in combination as adulterants, it becomes more difficult to make quantitative determinations instantly by the fluorescent method; hence the qualification implied in the word often. But "practice makes perfect" in many operations, and this is no exception to the rule.

It might naturally be supposed, in a method of comparison of this nature, that it would be necessary for all of the test tubes or phials used to contain the standards and the samples to be tested to be of absolutely uniform size, also that precisely the same quantities of oils should be used in all of the tests; such, however, is not the case. I soon noticed that the color of the fluorescence of any sample of mineral or resin oil was not changed by differences in the quantity of oil examined or in the dimensions of the bottles containing the specimens, differing, in this respect, from the marked change in color of the same samples viewed by transmitted light in glass containers of different sizes. To illustrate this interesting observation I have prepared exceedingly thin films of mineral and resin oils (scarcely thicker than soap bubble films) by pressing a few drops of each between plates of clear glass and mounting them like lantern slides. Crude mineral oil and resin oil are very dark in color and are opaque in four-ounce bottles, but the films are so transparent as to be almost invisible when viewed by transmitted light of any kind. When placed against a black background, however, and examined by reflected light from the source I employ, they fluoresce brilliantly in the same green and blue colors that large quantities of the same oils show under the same light.

The apparatus generally used by scientists for studying fluorescence is quite elaborate and costly, consisting of quartz prisms and lenses mounted in a spectroscope and requiring highly trained observers; but, fortunately, for the practical use and value of this new method in industrial works, I have found, ready at hand (in every establishment probably) a source of light which is peculiarly adapted to the purpose, so that no special appliances and no highly skilled operators are needed. In the works with which I am connected we have in daily use many kinds of electric lights, such as incandescent filaments of carbon, tungsten, etc., Cooper-Hewitt mercury vapor tubes, ordinary electric-arcs, flaming-arcs and enclosed arc-lights. It is one of these forms that I have found not only best adapted to and most convenient for the purpose, but actually far more effective than any of the costly outfits for studying fluorescence that I have examined in one of the best appointed physical laboratories in the country.

Incidentally I may say that I have asked a number of scientists to guess which one of the forms of electric light named is the one most likely to be found suitable for this purpose. All but one said the "Cooper-Hewitt mercury-vapor light," the other said, "the flaming-arc." They were wrong; it is the ordinary enclosed arc, so commonly used in industrial works by reason of its relative economy, that happens to give out rays of the exact wave lengths needed to enormously increase the fluorescence of these oils. If the plain glass cover of this light fits properly, so that air does not enter as rapidly as it is consumed, the arc burns in a partial vacuum, or at least, the air is rarified and, under these normal conditions, this light shows continuously, after burning a minute, a faint rosy light in addition to the powerful white light. If now a vessel containing any mineral oil, crude or refined, or any resin oil, be placed in the path of these rays, the most intense fluorescence appears, even in daylight, greenish in the case of mineral oil, blue in the case of resin oil, the thin films already mentioned glowing in the same manner. So strong is this fluorescence that if one cubic centimeter of either mineral oil or resin oil be diffused in a bottle containing ninety-nine cubic centimeters of linseed oil, or any non-fluorescent oil, its presence is plainly seen; and I have even detected one cubic centimeter of crude mineral oil in nine hundred and ninety-nine cubic centimeters of non-fluorescent oil.

I have examined a large number of vegetable oils, such as cottonseed oil, corn oil, China bean oil, China wood oil, etc.; and have not found a trace of fluorescence in any of them. It is stated in some text-books that "oleic acid," which is found in lard oil, is fluorescent. On examination I find that pure white strained lard oil is entirely free from fluorescence under the ultra-violet ray, but all of the samples of so-called No. 1 or No. 2 lard oil (sold for use in machine shops) examined possess some fluorescence, and this may prove to be a novel means of rapidly determining the proportion of oleic acid in lard oil, though I only suggest it tentatively, not having studied the matter carefully from this point of view. The slight fluorescence of ordinary lard oil is different in appearance from that of mineral oil or resin oil, and does not materially interfere with the application of the fluorescent test for its adulteration with mineral or resin oil. There is a metal-cutting compound sold called "mineral lard oil" —there is no deception here, for its name proclaims its composition. The proportion of mineral oil in this compound is sufficient to cause intense fluorescence when examined under the rays of the enclosed arc.

In order to make a quantitative fluorescent oil analysis—if I may be permitted to coin such a term—in cases where the amount of mineral or resin oil in vegetable or animal oil is over ten per cent., causing too great intensity of fluorescence for accurate quantitative determinations, it is simply necessary to dilute the sample to any desired degree for the test by adding sufficient pure vegetable or animal oil, as the case may be, to bring the proportion of adulterant within that of the prepared standards. Thus, if the sample of adulterated oil showing more intense fluorescence than the ten per cent. standard is diluted with an equal quantity of pure non-fluorescent oil and then shows a degree of fluorescence corresponding with the ten per-cent standard, it is safe to conclude that it contains twenty per cent. of fluorescent adulterant.

In daily practice I have found it convenient to put the standards in narrow tubular oil test bottles holding about fifty cubic centimeters each; these are corked, labeled, and placed side by side in small wooden racks (like test-tube holders) on a shelf in proximity to an enclosed arc-light, beginning with pure oil at the left-hand side, then a similar sample containing one-tenth per cent. of mineral or resin oil, as the case may be, then one per cent., and so on, increasing by single percentages up to ten per cent. It is advisable to prepare several different series of standards with fluorescent oils of different grades. Crude mineral or resin oils are much darker in color than refined oils, and the color by transmitted light is a guide to the kind of oil that has been used for adulteration, and is consequently an indication of the proper standard series to be used for comparison in making a quantitative fluorescent analysis. It is not necessary to prepare standards for each kind of vegetable or animal oil; thus, the standard series prepared with linseed oil serves for examination

of cottonseed oil, corn oil, China wood oil, China bean oil, or any other non-fluorescent vegetable oil. It is necessary, however, to prepare special standards with lard oil for testing adulterated lard oils.

The ingenious inventor of oil sand cores (now so largely superseding cores made by the old methods) conferred a valuable boon to founders, but his name, unfortunately, is unknown. Probably the process was, at first, guarded as a trade secret, but such secrets cannot be kept inviolate for any length of time; very recently I have experienced this. Two novel processes were devised in the works with which I am connected, and before they had been in practical daily use for one month knowledge regarding them was conveyed by workmen to another establishment, and doubtless the same will be repeated elsewhere, so that in a brief time both methods will be common property. Process patents are rarely of monetary value, as they are easily evaded. The making of oil sand cores has grown enormously in recent years, and many thousands of dollars are spent annually by large concerns for oils for this purpose. The compounding of core oils has become a large business, and nearly all samples that have come to my notice contain mineral or resin oil or both. Neither of these oils impart any valuable properties to core oils, but are used simply to dilute more costly oils; and, in point of fact, they are positively deleterious, being of a non-drying nature, impairing the good oil binder and requiring more fuel and a longer time for baking the cores in the ovens. When we realize that linseed oil (which is the best binder) costs, at the present time, in the neighborhood of one dollar per gallon, and crude mineral oil about three cents per gallon, its use as an adulterant is readily explained. Resin oil costs a good deal more and is therefore used more sparingly.*

I have found that "Soya" oil expressed from beans grown in enormous quantities in China and elsewhere, is an excellent substitute for linseed oil for making cores if used in its natural state, without having been compounded or adulterated by core-oil makers. It costs about sixty cents per gallon for fine grades. The very best substitute for linseed oil as a binder for oil cores that I have discovered is crude whale oil, costing about the same as Soya oil, the only objection to its use being an unpleasant fishy smell which escapes from the core ovens during the baking of cores. It makes a splendid binder. I am told it is now being deodorized, but I doubt the effectiveness of any such treatment. Cottonseed oil is used for the same purpose, but so much larger proportion of oil to sand is required that there is little economy in its use as compared with the other vegetable oils.

A simple and practical test of the value of core oils is to make a dozen companion test cores 1 by 1 by 15 inches from batches of pure linseed oil and sharp sand, and also from the same proportions of any other oil and sharp sand. These are placed side by side on an iron plate and baked under precisely the same heat conditions. When cold they are broken on a transverse testing machine with supports 12 inches apart. The relation between the average strength of the two sets of test cores is a measure of the binding qualities of the oils.

The prime motive of this paper has been to present to the American Society for Testing Materials a new and practical method, suitable for daily use in industrial works of instantly detecting, without chemical analysis or highly skilled operatives, the presence, and, in many instances, the actual proportion of cheap mineral or resin oil adulterants in costly vegetable and vegetable oils now used in great quantities in such establishments.

In conclusion, I venture to express the hope and belief that the process here described will prove to be all that is claimed for it, and applicable to all manufacturing industries using vegetable and animal oils for sundry purposes; that it will even prove helpful in analytical laboratories; that it may serve to discourage the making of de-bloomed oils for purposes of adulterating other oils; and that it may be a worthy contribution to applied science by one whose somewhat lengthy professional life, extending over forty years, has been mainly occupied in experimental work in large industrial establishments.

*The price of linseed oil has been doubled in the past few years. Recent statistics show that in the United States alone over twenty-five million bushels of flaxseed are consumed annually in the manufacture of linseed oil, the bulk of which is used for paint. To produce so much seed requires from two million to two and one-half million acres under cultivation.

UNITED STATES TARIFF DECISIONS.

Enameled Dials.

In a recent decision, Abstract 24,103 (T. D. 31,019), the Board of United States General Appraisers held that certain dial plates made of copper and enamel, which were assessed with duty under paragraph 192 of the tariff act of August 5, 1909, were properly dutiable under paragraph 199 of the said act as manufactures of metal.

Rate of Duty on Metal Cases.

Cigarette cases composed of gun metal and white metal, respectively, were imported to this country through the port of New York by C. A. Clark, and duty was assessed thereon at the rate of 85 per cent. ad valorem under Par. 448 of the Tariff Act of 1909. The importer claims the articles in question are dutiable as smokers' articles at the rate of 60 per cent. ad valorem under Par. 475 of the same act. Judge Sharretts, of the Board of United States General Appraisers upheld this claim upon the authority of previous decisions. All other merchandise and all other claims in the protest were overruled.

Rolled Sheets of Metal Pay 45 Per Cent.

Hermann Boker & Co. and others failed to receive a favorable decision by the Board of United States General Appraisers in a case involving the classification of iron and steel sheets nickel plated. The merchandise consisted of rolled sheets formed by welding to a plate of iron or steel, one of both sides, a sheet of nickel, and then rolling the metal so united down to the thickness of the sheet as imported.

The articles were assessed for duty at the rate of 45 per cent. ad valorem, as manufactures in chief value of metal, and are claimed by the importers to be dutiable at specific rates under paragraphs 131 and 132 of the present tariff act as sheets of iron or steel, coated. Judge Fischer holds in his decision that the collector made no error in his classification, and that in harmony with the rulings of the United States courts the higher duty must stand.

COPPER TO BOMBAY.

United States Consul E. Haldeman Dennison reports that:

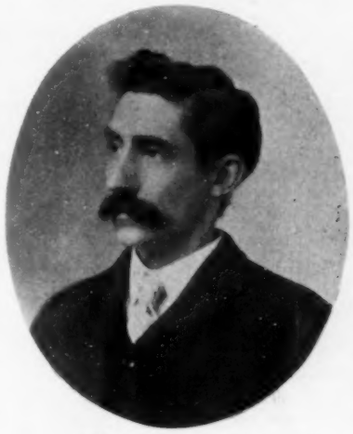
Copper represented 21 per cent. of the total value of all metals imported into Bombay for 1910. Stable conditions prevailed in the copper trade during the year, and the quantity imported shows only a fractional decrease from that of the previous year.

ROLLING BARREL POLISHING.

A Description of Modern Mechanical Methods for the Finishing of Small Metal Articles.

By George E. Prentice.

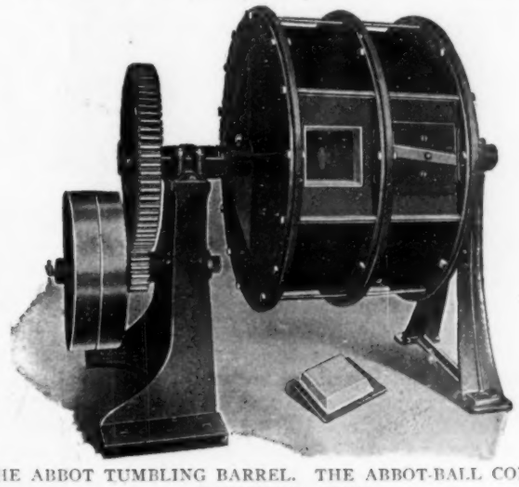
The use of rolling barrels for roughing down, cleaning and smoothing up work is quite old, but their adaptation for polishing and burnishing is so recent and extensive it could easily be called a new art, and when fully understood it is a very important art in the economic production of small metal parts of every description. Like any other new art, it has been taken up very extensively, and in the hands of some proved very successful, while others have met with very indifferent results. To the writer's personal knowledge there are manufacturing plants in which a battery of rolling barrels has supplanted the labor of from forty to fifty burnishers and buffers.



GEORGE E. PRENTICE.

To begin with, I wish to emphasize the fact that there is no royal road by which all kinds of work can be brought to the same degree of perfection. There also seems to be considerable misconception of the terms, polishing and burnishing; for instance, hardened steel cannot be burnished, but can be polished, soft steel can be either burnished or polished, while brass can be burnished, but can be but indifferently polished in a rolling barrel. Each of the above methods will be taken up in turn, but before doing so, I wish to subdivide work of the same material into classes as follows: heavy, medium and light, while the different classes of work merge into each other; for illustration, I put goods from material one-sixteenth of an inch and thicker into the heavy, those from .020 to one-sixteenth inch in the medium, and .020 and below into the light class. As your readers are well aware, a bushel of work made from material twenty-one-thousandths of an inch thickness (unless left in the flat blank) is very much lighter than a bushel of work made from the same kind of material one-sixteenth of an inch in thickness.

OBLIQUE TUMBLING BARREL. BAIRD MACHINE COMPANY, OAKVILLE, CONN.



THE ABBOT TUMBLING BARREL. THE ABBOT-BALL COMPANY, HARTFORD, CONN.

KIND OF BARRELS.

Cast or wrought iron, wood or wood lined, horizontal or oblique; any of them will do the trick, but I prefer a cast iron horizontal barrel for cutting down, and a horizontal wood-lined barrel for burnishing and an oblique barrel for drying out. Assuming we have barrels of this description, we will now take up the matter of speed, which is very closely related to the different classes. It is the writer's belief that practically all failures are on account of lack of knowledge on this point. Light work will stand more speed than heavy; while it is desirable to get all the speed possible (in order to save time), a peripheral speed of 2,250 ins. per minute for light work should not be exceeded, for two reasons; first, it will be found that just beyond this speed centrifugal force will begin to take hold and the work or goods will begin to rotate with the barrel instead of within it; second, when the work is so light and this does not take place the added friction will cause the solution to heat and form a gas; in this case the work will discolor. For the medium class a peripheral speed of 1,500 ins. per minute should not be exceeded, and for the heavy class 1,000 ins.

It will be found that with the medium and heavy classes, if these speeds are exceeded, the work has a tendency to pound and not burnish, and if run for any length of time the edges of same will roll over in much the same manner as the head of a chisel that has been in use for some time. This does not apply on hardened steel, for which the higher speed may be used, on all classes. Please note these speeds and classes are not to be taken arbitrarily, as hardly any two parties make exactly the same articles. It is the writer's intent to give the best possible basis to work from for any class of goods.

The reader may think there is an unnecessary amount of detail in the foregoing, but if followed closely he will be surprised how easy it will be to get the best possible results; even more so than with the material used, which we will now discuss.

TO CUT AND POLISH HARDENED STEEL.

To one bushel of work add about one peck of soft steel or iron scrap or plugs, about twenty pounds of

ground flint, or any sharp sand free from pebbles, a piece of cyanide of potassium about the size of an English walnut. Use an iron barrel; if an horizontal, just cover the work with water; run until thoroughly cut down, at which time the work will have a fine silver grey color; wash thoroughly; transfer to another iron or wood-lined barrel (never use a cutting down barrel for polishing); add about one pint of Vienna lime, one-fourth ounce of cocoa butter; cover with water, roll until the desired finish is obtained, which should be in about forty-eight hours if properly cut; wash thoroughly with cold water; dip in benzine; dry out in an oblique barrel with clear sawdust. The steel or iron scrap can be separated and used over and over. Care should be taken when opening the barrels, as some gas forms, and the solution is apt to spray out.

TO CUT AND POLISH SOFT STEEL.

To one bushel of work, add about ten pounds of any very fine abrasive such as dry tripoli, pumice, or very fine sand, such as molders use is equally as good; to this add about one-half pint of soft soap; cover with water; polish the same as hardened steel. Neither

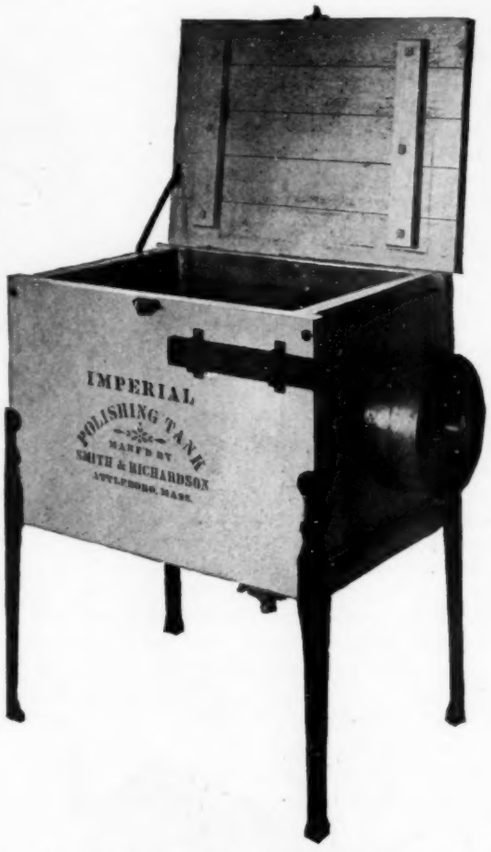
THE GLOBE CAST IRON HEXAGONAL TUMBLING BARREL. THE GLOBE MACHINE AND STAMPING COMPANY, CLEVELAND, OHIO.

operations take as long as on hardened steel, but if the goods belong to the light class and are made from bright, cold, rolled steel, a much simpler way is to dispense with the cutting down and use to polish a bushel of work about one-half pint of soap bark, one-fourth pint of cream of tartar. Fill barrel quite full of water and roll from twenty to thirty hours; wash in clean, cold water; dry in sawdust; then, if the work is to be nickel plated, after plating, roll for about two hours in borax water; but if the work is for brass plating, treat after plating, same as hereinafter given for burnishing brass, only for a less time.

TO CUT AND BURNISH BRASS.

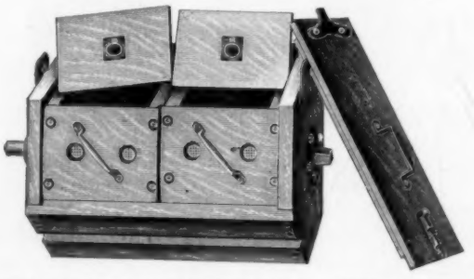
First cut down exactly as given for soft steel (be very sure and do not forget the soap); then have the work bright dipped in the usual manner. It is then ready for burnishing. To one bushel of work add from one-eighth to one-fourth the volume of highly polished steel balls, one pint of soft soap; use wood-lined barrel; fill quite full of water; roll about twenty hours; wash thoroughly in cold water; rinse in hot water; dry in clean sawdust; the results will be astonishing to anyone that has not tried it out. Goods with uneven surfaces will be far superior to the best products of a rag buffing wheel, at an extremely small portion of the cost.

In closing, I wish to state, the only form of work



THE IMPERIAL POLISHING OR BURNISHING MACHINE. SMITH & RICHARDSON, ATTLEBORO, MASS.

that cannot be successfully polished or burnished by following the foregoing instructions, is work that, on account of its shape, cobbs or tangles. Even this class can oftentimes be satisfactorily finished by manipulating the loading or speed of the barrels.



THE INNER TANK OF THE "IMPERIAL." SMITH & RICHARDSON, ATTLEBORO, MASS.

HARDWARE GREENS ON BRASS.

Nitrate of iron gives better results in producing hardware greens upon cast brass or sheet metal goods than acetate of lead. The usual method is pursued of dissolving the nitrate of iron in hyposulphite of soda—one ounce of the iron in four to eight ounces of the soda in each gallon of water. Use hot.

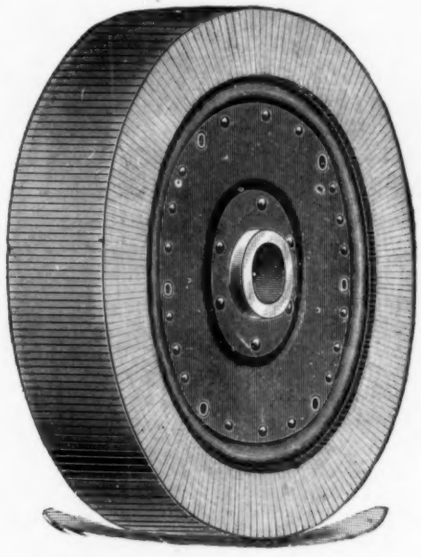
POLISHING WHEELS, THEIR CONSTRUCTION, USE, CARE AND ABUSE

By T. C. Eichstaedt.*

Even though my previous article† treated only the leather-covered wooden wheel, there is still much to be said regarding them. As far back as twenty-five years ago, when the solid emery wheel was considered a dangerous wheel to work on, the hardwood leather-covered wheel was used quite extensively to grind gates or burs. I have seen them in use for such work, set up in numbers 24, 30, 36 and 46 emery, and they did quite good service, but that time has passed, and we now have the solid emery, corundum and carborundum with a number of different ones, which have been perfected for all kinds of speeds and grades of work; bronze, brass, steel, gray iron, malleable iron and aluminum.

The manufacturers of these different wheels have made a scientific study of the different kinds of work to be ground and deserve a great deal of credit for the way in which they have made it possible for those that need wheels for grinding, simply to specify the kind of work they have to do and the proper kind of grinding wheel will be sent to them. While the tendency of the trade is to get away from the use of leather-covered wooden wheels, there is a lot of work that can be done on this wheel better and more economically than on any other wheel known to the trade, if done by a mechanic experienced in the use of them. I do not know of any other reason for taking the leather-covered wooden wheel out of use than that it requires more skill to operate than any other wheel known to the trade. There are, indeed, some factories that should have some of them now, in order to get their work done properly, but they have none, simply because the man in charge does not know how to work on them.

BULL NECK LEATHER WHEEL.



DIVINE LEATHER COMPRESSED WHEEL.

LEATHER POLISHING WHEELS SOLD BY THE HANSON AND VAN WINKLE COMPANY, NEWARK, N. J.

COMPRESSED LEATHER WHEEL.

Next to the leather-covered wooden wheel for efficiency comes the compressed leather wheel. This wheel was invented about twenty years ago, and is made by cutting out the leather in such a way that it is put into a large band and compressed together into the size required and set in steel flanges, the edges of the leather being used for the surface of the wheel. These wheels are made in almost any size that one may desire, and of various cushion, the cushion being that part of the leather extending outside of the flanges. I would recommend the two-inch cushion as the best for all around purposes, as it will be more resilient than a small cushion. I have used these wheels as large as four and one-half inches face and twenty-two inches in diameter, and have done some good work on them. I have also worked on some as small as ten inches in diameter and one inch in width.

While one can do any kind of work on these wheels that can be done on a leather-covered wooden wheel, one cannot keep as square an edge and corners on the work as one can with the wooden wheel. I will say that the compressed leather wheel, if properly handled, will last a lifetime, for I worked on one for eleven years and used it nearly every day of that time, and eight years after that I visited that same factory and the same wheel was still in use, the foreman telling me that it had been in constant use. As I am trying to give information regarding the construction, use, care and abuse of polishing wheels, I will now tell how these compressed wheels should be taken care of.

CARE OF THE WHEELS.

For flat or round straight work, the wheel should be kept flat with just the least little rise in the center, so that the work will not be gouged by the edges of the wheel. I have done hinges and butts and all kinds of builders' hardware of the flat order on these wheels with good success. A roughing wheel can be used quite a long time without cleaning it off. If worn down good and even it should be smoothed off with a

†The Metal Industry, February, 1911.

*Expert metal polisher and finisher.

buff stick or a piece of a solid emery wheel, being careful not to trim the edges too much, but still keeping them clean so as not to have the emery piling up on the edges, making it hard to keep in balance, and also dangerous. If the edge is trimmed too close the wheel cannot be kept with a square edge, and consequently it will become rounded on the corners. When a wheel gets in this condition it is not good for the kinds of work which should be done on the corner of this wheel. When used for roughing or fining it need not be cleaned off unless the leather shows through in places or if it is broken out. I mean the emery is broken out in places, and then it should be cleaned off in the same manner as the wooden wheel, but should be allowed to stay on the rollers only long enough to wash all the emery and glue off of it, and the water should be just warm enough to dissolve the glue. The wheel should not be hung up to dry, but should be laid down on its center, not letting it rest on the leather, for if laid down flat the bottom part of the leather would become soaked, as all the water would run down and settle there. If hung up the water would run down to the lower side of the wheel and that part would become water soaked. When leather becomes soaked with water it gets hard, and when compressed leather becomes hard it shrinks and consequently the wheel becomes full of spaces between the segments or sections of leather, thus making the wheel uneven and hard. In this condition it does not work well, and in a little while, if this is not given attention, the wheel will be useless, and in fact, very dangerous to work on. The proper way to care for this flat-faced compress wheel, after washing off on rollers, is to let it lie on its center for a little while, and then put on the lathe and use a piece of coarse sandpaper on it to clean it thoroughly, then reset the same as the wooden wheel.

DRESSING THE WHEEL.

Always use a double coat for roughing and fining. When double coating any wheel it is always advisable to put a finer grade of emery next to the leather than is required on the outside. For instance, if one wanted to use the wheel in No. 80 emery, it would be well to put No. 120 or No. 100 or No. 90, whichever one has, for the first coat, and in case one wished a No. 120 wheel, it should be first coated with No. 150 or No. 160, and then No. 120 on top, after drying the first coat thoroughly. The compress wheel, while an expensive one in its first cost, will save its price in glue and emery if properly taken care of and used for the right kinds of work. In order to keep these wheels pliable and resilient they should be oiled occasionally with neatsfoot oil, well rubbed in, and allowed to set for some time, over night being the best time. This will keep the leather from coming apart and also keep the wheel soft.

SETTING UP THE WHEEL.

The most essential thing in the use of all kinds of wheels is that they be balanced before using, and that they fit the arbor or spindle snugly in order that the face of the wheel will run true. One cannot do effective work on a wheel that is out of balance. If the wheel does not run true it will ruin not only the wheel but also the man and the machine. Another important thing in the use of any compress wheel is to run it always in one direction. Never reverse it, for more reasons than one; the first being that the leather is all put into the band before compressing with the hair side all the same way, with the express purpose that the wheel should be run only in the one direction which gives the best results. Second, the wheel is turned off in a lathe while running in that direction, and they are all marked with an arrow when received from the factory, so that there can be no mistake as to how they should run. Third, if one reverses the direction of the wheel, it turns the leather into the opposite direction, and this will ruin the wheel, make it uneven, and cause it to chatter and wear out quickly. One should also be careful, when putting the wheel on the rollers to wash it off, to see that it runs in the proper direction on the rollers, or it will turn the leather in the opposite direction, causing the wheel to become full of little hills, making ridges on each section of the leather. These ridges will wear through when using the wheel.

I know there are many who never wash wheels of this type, and indeed, many who claim that they should not be washed, but my experience has taught me that it is the best and most economical way to clean the flat-faced compress leather wheel. There is a practice which I have seen in almost every polishing room that I have been in, which I consider very bad, and one which is very hard to stop; at least I have found it so in all the places which I have had charge of; that is pounding the wheels unmercifully with either a wrench or some other heavy piece of iron or steel. I have seen men, who were supposed to have been polishers for years, do the same thing as if it did the wheel some good. The compress leather wheel should never be pounded.

These compress wheels can be bought either hard, soft or medium; also in oak-tanned leather or seahorse hide. The last mentioned will, of course, make a soft wheel. These wheels can also be made to fit irregular work, such as knife and fork handles, small monkey wrench handles, chain links, and many other similar articles.

SCOPE OF THE COMPRESSED WHEEL.

I will here make mention of work which I have seen done successfully and economically on the compress wheel in addition to those mentioned above: Bicycle work, such as hubs, cups, cones, square and hexagonal bolts, etc., shear sides, knives, stove work that is flat, cash registers, adding machines, pistols, rifles, gas engine parts; in fact, no well-equipped polishing room should be without a good number of these wheels. I would not consider my room well equipped without at least a half a dozen of these wheels. A hardware factory without a good supply of leather compress wheels I would consider behind the times, and it should wake up and investigate this type of wheel. I have had five years' experience on this particular work, and know that they will save time, emery and glue.

While these irregular surfaced wheels cannot be washed off on rollers like the flat-surfaced wheels, they can be washed off by holding a piece of wet waste against the surface of the wheel while it is in motion, having a bucket of warm water below the wheel and soaking the waste occasionally. Also, by holding a piece of pumice stone or soft sandstone under the wet waste; this is much better than using solid emery, as one is not likely to get the wheel out of shape or burn the leather.

The compress wheel is a patented wheel, and is made in nearly all sizes and for all kinds of work, and is made exclusively by Divine Brothers Company, Utica, N. Y., but can be purchased from almost any polishing and plating supply house in this country. There are also compress felt and canvas wheels, and of these I will speak in my next article.

A LIST OF WAXES.

A Detailed Description of the Various Varieties Used in the Arts.

By D. J. Lemal.

D. J. LEMAL.

Beeswax.—Specific gravity .965. The melting point is never less than 143 degrees Fahr. In ancient times wax was supposed to have been collected in the form of a farina from different flowers, but such is not the case. The bees transform it from honey by a process of digestion and exude it through ventral plates in the shape of little scales. I have heard and read at times recommendations to use, for one thing or another, white beeswax in a sense meaning that it is the virgin wax. There is no pure white beeswax, it is either pale yellow, yellow or reddish yellow, such as the Brazilian. It may be found white in the hive when freshly made but soon turns yellow. Melting it in iron or copper vessels will turn it brownish and greenish, overheating it will also brown it. It should be melted in galvanized or enameled vessels. It is soluble in either chloroform, benzol, bisulphide of carbon, turpentine and kerosene, the last is always so easy to get that I use it altogether to wash the wax off my hands when at work with it. It is partially soluble in boiling alcohol and insoluble in water or cold alcohol. The white wax is bleached, most waxes can be bleached, except those of inferior qualities, such as come from South America; that of Brazil, a wax of mahogany color cannot be bleached at all. The usual way to bleach it is to slice it into thin shavings and expose it to the sun's rays. The melting point of bleached beeswax is one degree higher than the virgin wax.

Owing to the high price of wax, dealers are tempted to adulterate it with cheaper kinds of wax, such as paraffin, ozocerite, carnauba, Chinese and Japanese wax, tallow, stearine, chalk, starch, sulphate of baryta and even fine clay, such as kaolin. Beeswax when chewed should afford no unpleasant taste and should not stick to the teeth or become pasty, but disintegrate and break up, paraffin on the other hand is cohesive when chewed like chewing gum. Until recently when anybody wanted wax tested in a hurry they came to me; I would satisfy them quickly. Now, however, I am not so accommodating, as I was required to test a piece of nice wax color and found that it was soap—I am sure it was soap as I chewed some of it. A good test is to place a small piece of the suspected wax in a test-tube, add some spirit of turpentine and gently heat over a spirit lamp. If the solution is imperfect or very cloudy or if a precipitate is formed the wax is adulterated, as spirit of turpentine dissolves pure wax completely. To detect paraffin in wax, heat it with fuming sulphuric acid, which destroys the wax, converting it into a black jelly-like mass while the paraffin is left as a transparent layer on the surface. The admixture of fats may be detected by the acrid odor of the vapors given off on throwing the suspected wax upon a red hot surface. A very simple mode of detecting adulteration is by the specific gravity test. Wax is lighter than water, standing .965 and water 1.000. Into a vessel (a glass preferred) of water, place a piece of wax of known purity, pour in alcohol and stir at same time until the wax sinks to the bottom. Now try the suspected adulterated wax. If it contains a large amount of paraffin or other wax, it will float on the top, if only a little adulterant it will still float but with a tendency to sink; the percentage can be judged accordingly.

Mineral Wax.—Ozocerit, Ozocerite or earthwax. Specific gravity .915 to .925. Melting point 140 to 176 degrees Fahr., and is sparingly soluble in boiling alcohol, soluble in chloroform and benzol. It is found in many places in the ground—in Caucasus, Transylvania, Roumania, England, Italy, Texas, California. The largest deposit in the United States is in Utah. In Austrian Poland or Galicia, the town of Boryslaw, a town of about 6,000 inhabitants, is entirely supported from its mines of ozocerite, where men are earning forty cents a day and children ten cents. This wax is found at the depth of from twenty to seventy feet and some shafts at Boryslaw have been sunk 700 feet.

Its color is brown or brownish yellow by transmitted light, and leek green by reflected light. The poorer qualities which are colored black and are either too soft, from abundance of petroleum, or too hard (asphalt like in character) are used abroad for the production of paraffin, as it is a product of paraffin oil (petroleum). We have a fair example of it in America, as the petroleum refineries supply the market with what may be called an artificial ozocerite, which is a residue of oil that sinks to the bottom of the large stills that are used in refining. I remember when the Standard Oil Company started their works at Constable Hook, Bayonne, N. J., the cleanings of their stills were dumped in the meadows around their place, but later on, a candle factory came along and dug the whole thing up and turned it into paraffine candles. Ozocerite cools much quicker and shrinks more than beeswax. To counteract the shrinking Venetian turpentine is used, but boiling kerosene oil with it will also prevent it from shrinking too much. The following substances are classed as mineral waxes, and are sometimes used for adulterating beeswax:

Zietrisikite.—A mineral wax similar to ozocerite. It is found at Zietrisika in Moldavia, whence its name. Its behavior is the same as that of ozocerite.

Hatchettine or Hatchettite is a waxy substance found in Glamorganshire and Moravia near Liege in Belgium, also in a few other places. It is of greenish yellow color or brown. Pearly in appearance and in consistency like spermaceti. This substance is sparingly soluble in boiling alcohol and ether, leaving a viscous residue.

Elaterite is a mineral resin, blackish in color, verging on green, and occurs in soft flexible masses near Castleton in Derbyshire and in the coal measures of Montrelasi in France and melts at a very high temperature. Idrialine or Idrialite—a bituminous substance obtained from the mercury mines of Idria, where it occurs, mixed with cinnabar. The color is white resembling spermaceti and is sparingly soluble in alcohol.

Cow-Tree Wax.—Melts at 140 degrees Fahr., and closely resembles beeswax. It is of a fatty waxy matter.

(To be continued.)

NOTES ON THE DETERMINATION OF PHOSPHORUS AND SULPHUR IN COAL AND COKE.

By Warren I. Keeler.

Naturally the percentage of phosphorus and sulphur in solid fuels is of particular interest to foundrymen, and of very little interest to the commercial world unless the sulphur happens to be abnormally high and in such a state that it is readily fusible.

The methods for determining these constituents of fuels, which the writer is about to describe, are in no sense new, but are merely modifications of well known and standard methods. These adaptations, however, are of such a nature that the time for determination is considerably shortened without in any sense sacrificing the accuracy; hence it is hoped that they may prove of interest to the foundry and steel works chemist.

PHOSPHORUS DETERMINATION.

Two grams of the coal or coke ground to pass a hundred mesh seive are spread out on the bottom of a platinum ash dish. A convenient size for this dish is two inches in diameter and one inch in depth. An ordinary tripod, about nine inches high, strung with platinum wire, and a Teclue burner complete the equipment for ashing.

For coke and hard coals the full flame may be applied immediately, but in case of bituminous and other soft coals the flame should be turned on very gradually, in order that no coal shall be lost in the escape of the volatile matter. In all cases, however, it has been found expeditious to tip the dish slightly forward and start the flame at the extreme back edge, gradually moving same forward until the flame hits the centre of the dish. The carbon should be sufficiently burnt off in about one hour, although the time may be considerably shortened by frequently stirring with a platinum rod.

When combustion is complete the ash is carefully transferred to a 300 c. cm. Erlenmeyer flask of Jena glassware. Now 20 c. c. of concentrated nitric acid and 5 c. c. of concentrated hydrochloric acid are added, and the solution is evaporated to dryness and baked for five minutes after the cessation of all fumes. The baked oxides are taken up in 15 c. c. of concentrated hydrochloric acid and again evaporated to 5 c. c., when the solution is diluted and filtered from the silica. Next evaporate the solution to which 20 c.c. of concentrated nitric acid have been added down to 5 c.c. again, add 20 c.c. of a saturated solution of chromic acid in concentrated nitric acid and continue the evaporation to about 15 c.c. Precipitate the phosphorus by adding 50 c.c. of molybdate solution (as per Blair "direct weighing of the phospho-molybdate") heated to 60 degrees Cent., and finish as usual in iron or steel, either weighing as phospho-molybdate or running through the reductor and titrating with permanganate.

It may be noted that while it has been customary to take 5 grams of the solid fuel for this determination, we have found that the method outlined is sufficiently accurate to require only two grams. Of course the phosphorus would rarely run higher that 0.10 per cent., but it would also usually be as high as 0.05, and this method is quite capable of determining that or even lower percentages of phosphorus; in fact we have been able to obtain very accurate and consistent results thereby. It is also true that there is no need, for purposes of accuracy, of grinding the sample so fine as suggested, but it has been found that the time saved thereby in ashing more than compensates for the increased time taken in grinding.

SULPHUR DETERMINATION.

One gram in case of coke or hard coal, and one-half gram in case of soft coal, is ground to pass the one hundred mesh sieve, or even finer where feasible. The sample is then intimately mixed in a 20 c.c. platinum crucible three-quarters full of the usual Eschka's mixture, namely magnesium oxide and sodium carbonate in the ratio of two to one. It may be stated that the finer the coal has been ground, the more thoroughly the Eschka's mixture has been mixed, and the more carefully the sample of fuel and flux are stirred together, the more accurate and rapid will be the results.

The crucible rests in a hole, cut in a heavy asbestos board, slightly smaller than its greatest diameter, so that fully three-quarters of the crucible is below the board. The asbestos board in turn rests on an ordinary tripod; and providing the crucible rest very snugly in the asbestos, and that the board is of generous dimensions (six inches square by one-quarter inch thick), we have found the Teclue burner the best source of heat.

In the case of fuels high in combustible matter the flame should be started very low and gradually raised with constant stirring for about ten minutes; but for hard coals and coke the full flame may be placed under the crucible immediately. In all cases frequent stirring with a platinum rod are advisable and helpful. The heating should continue in the uncovered crucible until the gray color of the mixture has given way to a yellow or red brown color, and all the carbon has been consumed, when the heat is turned off and the crucible with its contents is brought to room temperature. Now add one gram of thoroughly dried and powdered ammonium nitrate, stir thoroughly, place a cover on the crucible and keep at a low red heat for two minutes with a slow flame. Remove the cover and turn on the full force of the burner for another minute before finally extinguishing.

When the crucible is quite cold transfer the contents to a small beaker, washing the crucible well with hot water only; allow the contents of the beaker to boil for about two minutes, then filter and wash well with hot water. Add to the filtrate 15 c.c. of concentrated hydrochloric acid, 8 c.c. of barium chloride twenty per cent. strong, and sufficient hot water to bring the volume to 100 c.c. This filtrate is conveniently caught in a plain 150 c.c. beaker of Jena glassware.

Bring the solution to a slow boil and boil hard for ten minutes; allow to settle for twenty minutes, filter through double filters of dense quality, wash the precipitate of barium sulphate onto the paper with hot dilute hydrochloric acid, ten per cent. strong, and wash the paper thoroughly and alternately for six times with hot dilute acid and cold water. Ignite the precipitate of barium sulphate with the usual precautions in a platinum crucible and calculate the sulphur, the conversion factor being 0.1375.

As will be readily seen from a glance at the table the top horizontal line gives the weights of barium sulphate in intervals of ten milligrams, whereas the left hand vertical column gives the intermediate weights of barium sulphate in intervals of half milligrams. As the table is based on a weight of one-half gram, it will be necessary where one gram of solid fuel has been used, to divide the weight of barium sulphate by two before looking up on the table. By way of illustration suppose the barium sulphate from a one gram sample of coal weighs 0.0850, we first divide the 850 by 2, obtaining 425; on the top horizontal line we find 400 and follow down this line until

we are opposite 25 on the extreme left hand vertical column, thus obtaining a result of 1.17 per cent. for our percentage sulphur in the given sample of coal.

Table for calculating per cent. of sulphur in fuels, from weight of Barium Sulphate.

0	00	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160
00	000	027	055	082	110	137	165	192	220	247	274	302	330	357	385	412	440
05	001	029	056	084	111	139	166	194	221	249	276	304	331	359	386	414	441
10	003	030	058	085	113	140	168	195	223	250	278	305	333	360	388	415	443
15	004	031	059	086	114	141	169	196	224	251	279	306	334	361	389	416	444
20	005	032	060	087	115	142	170	197	225	252	280	307	335	362	390	417	445
25	007	033	062	088	117	143	172	198	227	253	282	308	337	363	392	418	447
30	008	035	063	090	118	145	173	200	228	255	283	310	338	365	393	420	448
35	010	037	065	092	120	147	175	202	230	257	285	312	340	367	395	422	450
40	011	038	066	093	121	148	176	203	231	258	286	313	341	368	396	423	451
45	012	040	067	095	122	150	177	205	232	260	287	315	342	370	397	425	452
50	014	041	069	096	124	151	179	206	234	261	289	316	344	371	399	426	454
55	015	043	070	098	125	153	180	208	235	263	290	318	345	373	400	428	455
60	016	044	071	099	126	154	181	209	236	264	291	319	346	374	401	429	456
65	018	045	073	100	128	155	183	210	238	265	293	320	348	375	403	430	458
70	019	047	074	102	129	157	184	212	239	267	294	322	349	377	404	432	459
75	021	048	076	103	131	158	186	213	241	268	296	323	351	378	406	433	461
80	022	049	077	104	132	159	187	214	242	269	297	324	352	379	407	434	462
85	023	051	078	106	133	161	188	216	243	271	298	326	353	381	408	436	463
90	025	052	080	107	135	162	190	217	245	272	300	327	355	382	410	437	465
95	026	053	081	108	136	163	191	218	246	273	301	328	356	383	411	438	467

It has been repeatedly advised not to use a gas flame, on account of the sulphur contained in the gas, but with the hereinbefore mentioned precautions of having the crucible fit snugly, and the asbestos board of ample dimensions, we have experienced no trouble from this source. In fact, we have been able to obtain thoroughly reliable and consistent results with a maximum of speed.

A PRACTICAL TALK ON SILVER PLATING

By W. A. Mackenzie.*

I will endeavor to try in this short talk, to explain why some platers have considerable difficulty in silver plating; the one chief reason lies in the fact that most platers do not thoroughly understand the how and why of the silver strike. The one great cause of failure in silver plating is the want of a proper striking solution. Now, briefly, in nickel plating, all that is necessary is to have work chemically clean before entering the solution (bath, of course, in good condition). In silver plating we have something else to contend with besides having work chemically clean. It is a well known fact that when a metal is immersed in a metallic solution of some other dissimilar metal the solution is decomposed, that is to say, the metal is precipitated out of the solution. Here is where failure in silver plating arises from, "at least mainly" the regular silver plating solution will precipitate its metal very readily on such metals as copper, brass, bronze and german silver.

What takes place when we immerse one of the above named metals in a cyanide of silver solution is this, the chemical affinity of the solution acting on the metal immersed causes the solution to be decomposed. If we should immerse a piece of copper in a cyanide of silver solution, the molecule of cyanide of silver will be broken up, the silver will leave the cyanide, and will be deposited on the piece of copper. This deposit is non-adherent, and if the piece of copper is left in the plating solution until plated with the electric current turned on, the plate will peel off. Here is where the striking solution comes into play, the striking solutions are usually weak solutions of silver, strong in cyanide of potassium, and should be used with a strong current, so as to cause gas to be given off freely. This infinitesimal deposit of silver, combined with the hydrogen, acts as a barrier against the chemical affinity of the silver solution. It is always preferable to mercury dip the metal before striking.

This can be accomplished by taking a quart bottle and putting therein 2 ozs. of red oxide of mercury, and a strong solution of cyanide of potassium, shake well; it will soon dissolve. A little of this solution added to a 10-gallon crock of water, with a piece of cyanide, will give a coat of mercury on brass, copper and german silver, sufficient to stand the immersion in the strike solution, until the electric current has time to give the metal the deposit referred to above. It is always best to touch the negative pole, with the wire that the article is suspended by before immersing in the striking solution; strike for a few seconds and transfer direct to the silver solution. The rheostat of the silver solution should be so connected that the current is never entirely shut off; more current should be turned on as fast as the tank is filled. In silvering nickeled articles the work can be taken direct from the rinsing water without using the mercury dip as above. If the work should happen to come from the silver solution streaked or cloudy this can be overcome by dipping the article in a solution of cyanide before striking. I plate nearly half a million pieces of sheet brass a year, which have on an average of one-half a square foot each, and I do not have one-tenth of 1 per cent. fail. I will state that the silver striking solution is used to prevent the non-adherent deposit of silver before the electric current has time to start the plate on the work being plated.

Any plater who will thoroughly clean his work before striking will have little trouble from work peeling. I use the double cyanide of silver and potassium and have perfect success with my plating, and I would not advise adding anything else to this solution. The solution will work well with from one-half to three ounces of silver to the gallon. With say, three ounces more current can be used without fear of burning the work.

This article is chiefly to point out the reason why we use a striking solution, and there has not been any attempt to go into detail as to the method of handling all classes of work. It will in all probability be of service to those platers that have not had much experience in silver plating.

*Foreman plater, E. & J. Lamp Company, Detroit, Mich.

NON-FERROUS FOUNDRY ECONOMIES AND REFINEMENTS*

Some Practical Suggestions for the Location and Construction of a Modern Brass Foundry.

By E. A. Barnes.†

(Concluded from July.)

Conservation of Heat in Spent Gases.—On visiting any foundry, one is struck with the enormous amount of apparent lost heat and energy that issues from the vents. This heat, in the form of spent gases, can be utilized for many useful purposes if proper arrangements are made in the design of the foundry to conserve them. Core ovens can be heated, as can also wash water for use in the lavatories; these are two of the most important. The preheating of air and oil is another. This, of course, involves piping and arrangements which may to some appear complicated and unnecessary, but they are, nevertheless, well worth taking into consideration.

Furnaces.—In the matter of furnaces, ladle heaters, scrap recovering furnaces, etc., these should come directly under the jurisdiction of the foundry itself, but their use should be supervised and directed by the foundry engineer. Enormous savings can be effected by the intelligent handling of the same. With the old system of coke and hard coal pit furnaces, which, of course, are adhered to for many kinds of production, the greatest injury done to the crucibles is from the rough handling with the tongs and the uneven heating and cooling. With the fuel oil system and tilting furnaces, which are becoming more and more popular, combined with the propagation of suitable reducing flame in a combustion chamber of sufficient volume and absolute control of temperature, this crucible loss is greatly reduced. It nevertheless calls for much thought and resourcefulness on the part of the furnace tender to produce the best results. It is here often hard to get the old time foundryman to take a real interest in these up-to-date arrangements.

One of the greatest items of loss in a brass and aluminum foundry is the shrinkage. This is occasioned in many ways. Poor system is responsible for all of them. Volatilization loss in the methods of melting is the most important. Before building our new foundry we investigated the different types of furnaces and ladle heaters on the market and found defects in all of them and therefore decided to design our own melting equipment, continuing the use of fuel oil, which we had found very satisfactory for seven or eight years.

In our furnace we employ the concentric burner, using compressed air at about 35 pounds per square inch, to pulverize to a mist the fuel oil, which is supplied at about 25 pounds pressure at the nozzle. This fuel oil and atomizing air are both pre-heated by proper arrangements before they issue from the burner. The volume air for combustion which is supplied through a truncated nozzle surrounding the concentric portion, is maintained at about 8 ounces pressure and by valves and gates both the compressed air and fuel oil and the volume air are controlled, maintaining the "reducing flame" whether a slow or a fast fire is desired. It is very necessary to have absolute control of your combustion in order to produce the reducing flame, otherwise at these high temperatures the oxygen of the air will combine with the free graphitic carbon and other components of the crucible and furnace lining and very rapidly disintegrate the same through chemical combination, and the metal itself will suffer loss and injury through oxidation.

Core-Making.—There are a number of ingenious machines produced for the rapid production of cores. It is safe to say that many novelties will be designed in core-making machines in the next few years. I especially look for great strides in the jarring machines for the production of large and complicated cores. Much is yet to be done in the field of permanent molds, cement patterns and the methods of gating and arranging work both on plates and on interchangeable gates. The proper selection of core oils, sands and other compounds used in the foundry is very essential and should not, as is often the case, be left to the judgment of the purchasing agent, but should be selected intelligently only after careful investigation and practical application.

Molding Benches.—Years ago we abandoned the unhandy and inefficient tub and in its place designed and installed suitable molding tables about six feet long and two feet wide. One-half of the top of this table is perforated with 2-inch holes drilled close together, allowing the sand which is cut off the flasks to at once fall through to the storage space below. The other half of the table is not perforated, and constitutes a bench on which the patterns and tools can readily be arranged. Underneath this solid part a drawer with a lock on it is supplied for the security of the molder's tools, swabs, etc. Each bench is equipped with an air-operated rapping hammer which can either be fastened by brackets to the bench itself or can be instantly removed and secured to match plates, allowing the molder at the bench to work either on plate work or individual patterns, as the demand for castings indicates. This rapping hammer is operated from a knee-pad actuated valve, affording the molder free use of both hands and obviating the necessity of calling for rapping assistance from neighbors or helpers.

Molding Machines.—All up-to-date foundries have molding machines. Choice and selection of these machines must be governed in a great measure by the nature of the work in hand. It will be found that certain machines lend themselves to interchangeability of patterns, squeezing, deep draws, shallow plate work, etc., better than others. It by no means follows that because a foundry has molding machines of one make that an entirely different type of molding machine would not greatly affect its efficiency.

Scrap Melting Furnaces—In a manufacturing industry like the one with which I am connected, we get skeleton brass from the punch press department, borings and turnings from the machine shop in large quantities each day. The regular practice is to run these through an efficient separator connected with a blower system, which takes out the iron, paper and light particles, passing the good metal into bins. In place of selling this stuff to the junk dealer at prices depending on varying conditions, we save and separate these borings, etc., and use them in our foundry at once. The copper and red brass borings are taken to the melting floor and are used up with gates, sprues and new metal. Much of this stuff, however, is of a mixed nature and cannot be so handled; it is therefore taken to the scrap melting furnace and run into ingots. These ingots are analyzed by the chemist, who determines closely their components. These ingots are further alloyed with pure copper and other new metals in varying proportions and first-class metal for all general purposes produced from them. We also handle in our scrap melt-

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ing furnace copper wire, which we get from burned out field coils, armature coils and scrap generally that is known to contain pure copper. The resultant pigs are analyzed and used as base copper for more important mixtures. The furnace is cleaned out, skeleton brass, borings, yellow brass, etc., are run off and stored for future use. With our scrap melting furnace we developed an endless chain arrangement for carrying the chills. The contents of these chills are automatically dumped into water, which cools, cleanses and softens the metal simultaneously. This system involves the continuous melting and pouring principle which we have found in practice to be preferable to the "hot bath" system where the metal is melted and tapped out into crucibles and repoured. This does not, however, indicate that the "hot bath" system is not better adapted to some other foundry requirements. A few cases of actual runs of scrap and the losses incident to the recovery of the same are as follows:

BARE COPPER WIRE.

Total wire melted	9,054	lbs.
Total ingot recovered	8,888	"
Loss or shrinkage	166	"
Loss in per cent	1.83	%

FINE WIRE.

(Includes burning off of insulation.)

Total wire melted	3,089	lbs.
Total ingot recovered	2,773	"
Loss or shrinkage	316	"
Loss in per cent	10.24	%

ALLOYING.—A great economy results from the pre-alloying of metals. In alloying aluminum and copper, it is a well-known fact that the copper, which melts at a much higher temperature than the aluminum, must be melted first. The aluminum is then added, combines with the copper, and through chemical action the temperature is liable to rise to a point that vaporizes off much of the aluminum. To rob this phenomenon of its most harmful effects, we have made a practice of compounding a rich alloy of half and half copper and aluminum, which we throw into pigs. The copper is melted first and the aluminum is added in small quantities, allowing the temperature to gradually reduce with each addition of aluminum, thus preventing overheating any considerable quantity of metal. This rich alloy, which now necessarily melts at a very much lower temperature than the original copper, is used in the final compounding of our aluminum mixture. All risk of overheating or mis-mixing large and individual batches is thus eliminated. Not only this, but the remelting has a refining effect and a much better product is insured.

The use of fluxes, such as phosphor tin, boron, magnesium, etc., etc., is much more effectively carried out under the direction of a chemist who, as before stated, makes a special study of the action of these fluxes on the metals. I am convinced that the employment of a chemist or foundry chemical engineer in a foundry of any size soon pays a handsome dividend on his salary. As a rule, the practical foundryman has too many other things to attend to in producing, to spend much time in developing.

COSTS.—In the matter of brass foundry costs, these must be taken up seriously and the different classes of work and styles of molding, etc., etc., classified. Many foundries are selling their product at so much a pound, basing their prices on the cost of raw materials and their last inventory and pay roll. They really don't know what any one casting is costing them. I will mention a case that came under our observation some time ago. In our aluminum department, using what we will designate Alloy No. 48, we have a heavy production of meter cases, the molding process making its own core. The cost of molding per 100 pounds was $3.03, the cost of furnace tender per 100 pounds $89, cleaning per 100 pounds $.42, making a total cost ready to deliver of $4.34 per 100 pounds. Another casting involving rather a complicated core figured the cost of the casting per 100 pounds $43.28. This shows the wide range of costs for different classes of work poured from the same alloy. Both operations were made on an up-to-date air-operated molding machine.

In our foundry our men work on regular foundry shop orders, which are subdivided as follows, enabling us, with proper co-operation of the foreman and molders, to segregate and check the different operating expenses.

78-A	Foremen and clerks.
B	Expenses, repairs, etc.
C	Scrap furnace.
D	K-3 meter cases.
E	Aluminum castings, machine molded, plain.
F	Aluminum castings, machine molded, cored.
G	Aluminum castings, bench molded, plain.
H	Aluminum castings, bench molded, cored.
I	Brass castings, machine molded, plain.
J	Brass castings, machine molded, cored.
K	Brass castings, bench molded, plain gated
L	Brass castings, bench molded, cored gated.
M	Brass castings, bench molded, plain ungated.
N	Brass castings, bench molded, cored ungated.
O	Solder and Babbitt.
P	Furnace tenders (aluminum).
Q	Furnace tenders (brass).
R	Clean aluminum castings.
S	Clean brass castings.

We try to confine our alloys and mixtures to as few in number as possible and at the present time we have no more than fifteen to contend with. This is quite an important matter, as the fewer combinations one has to compound, the better.

Much experimentation and research work are being carried on at the present time in the advancement of the foundry art along the lines of electric furnaces, and I believe that within the next few years radical changes will be incorporated, especially in foundries where electric power derived from water can be procured to heat the metals. The loss from oxidation and overheating would then be avoided. At the present time, of course, the cost of electricity is prohibitive for this work, but I look for improvements which will make it worth while.

We read about crucibles in which a vacuum is maintained and others in which inert gases are introduced. All these refinements are the result of study by the technically educated engineer and investigator, and I fully believe that the advancement in the next ten years in the whole foundry art will eclipse that made in the last twenty, by reason of the interest taken by scientists, as above mentioned, coupled with the general work of managers and experts who see in the wave of scientific management now overflowing the country a chance to introduce some of these refinements into their business.

PRIMITIVE METAL COLORING.

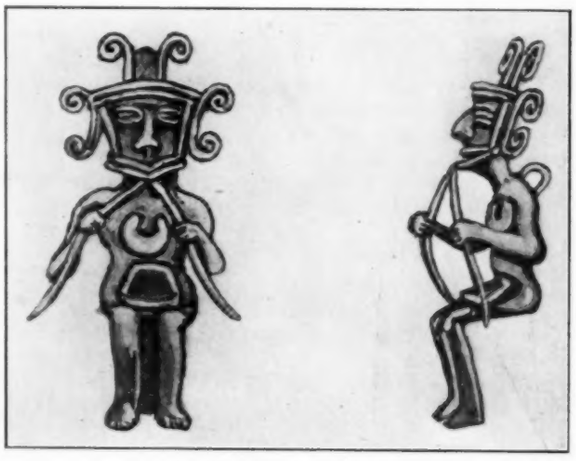
OSWALD H. EVANS, F. G. S.

An operation very familiar to workers in the precious metals is that known as "coloring," which has for its object the production of a superficial coating of gold of high quality on articles fashioned of relatively baser metal. Two general methods are in common use, the "hot" method, making use of fused or semi-fused mixtures of salts, and the "wet" method, in which the active re-agents are used in solution. For both processes innumerable formulae have been published, some of them resembling the catalogue of a chemist's shop and presumably held in esteem by their inventors in proportion to the number of mysterious ingredients added to the remarkable brew. The hot and the wet process alike effect the desired end by removing in solution a portion of the copper of the base metal, leaving the insoluble gold in the form of a coherent film capable of being, under suitable manipulation, burnished. It is possible that in most of the baths in common use, some small quantity of gold is dissolved, to be again precipitated upon the surface in the course of the operation, but a bath having such solvent action on the gold is not essential to the process.

It is not my object, in the present paper, to discuss the modern methods of coloring, but to endeavor to throw a little light on a problem that has long puzzled students of the antiquities of Central and South America, and to record the result of some rather unusual experiments carried out in the course of inquiry. At the time of the discovery of America, the attention of Columbus and his companions was attracted by the metal ornaments worn by the natives of the New World, particularly those met with on the Mainland. These ornaments, and, it is said, spear heads also, were made of a base gold alloy, called by them "Guanin," a sample of which, assayed in Spain, was found to be composed of gold, 56 per cent.; silver, 19 per cent. and copper, 25 per cent., but the proportions varied very considerably in different samples, gold, however, being always an important constituent and silver frequently absent. The Spaniards, misled by the comparative abundance of this metal in the hands of the natives, formed an exaggerated idea of the mineral wealth of the newly-discovered lands, for what they saw was probably the accumulated riches of generations of savages. They gave, in consequence, such hopeful names to the coast regions as "Costa Rica," "Castillo del Oro," and the like. In this connection it is interesting to note that Sir Francis Drake, according to an old manuscript now in the British Museum, "brought into England great store of gold, silver and copper in abundance (captured from the Spaniards), especially of the copper mines of Domingo. A great quantity whereof he brought into London, and much thereof was sold for red copper in price, whereof was made both kettles and pans, and great caldrons to boil in, ordnance and other cast pieces, before the worth thereof was known."

Now, the point I wish to direct attention to, is that the natives possessed a means of gilding, or rather, coloring the ornaments made from auriferous alloy in such manner that they had all the appearance of being made from fine gold. For many years specimens have found their way into museums and private collections, and, alas! in still greater quantity to the melting pot. The chief source of work of this character appears to lie in Central America, and particularly in the province of Chiriqui, but examples are found over an immense region embracing Darien Colombia, Ecuador and other parts of the Spanish Main. I have even seen a specimen found in Bolivia. The work has received much attention from students and has formed the subject of an important monograph by Holmes, which will be found in the 1884-5 report of the Bureau of Ethnology.

These peculiar objects of gold alloy are usually in the form of fantastic little figures, human or animal, frequently setting at naught the proprieties, and they are distinguished rather for quaint ugliness than for artistic quality. The constitution of the alloy ranges from nearly pure gold to a mixture so poor in gold that its presence is insufficient sensibly to affect the color of the alloy. Even these examples frequently present a surface of burnished gold. Sometimes the film of precious metal is so slight that it has all the appearance of having been electro-deposited, and many conjectures have been hazarded to explain the method by means of which the native artist obtained this effect. There is no evidence of any knowledge of mercury and its properties among the Indians of this region.



SOME PRIMITIVE METAL OBJECTS.

Holmes, in the treatise already mentioned, quotes, on the authority of Bollaert, a reference to the works of the Padre Acosta to the effect that the Indians of New Grenada gilded copper by rubbing it with the juices of certain herbs and afterwards subjected it to the action of fire, when it took the gold color, but states that he had not been able to find the passage in question. The present writer has also searched the pages of Acosta in vain, but it is probable that Bollaert quoted from memory the following passage in the "History of the Indies" of Gonzalo Fernandez de Oviedo (Edit. Amador de los Rios, vol. 4, p. 189), where that writer says, freely to translate the passage: "I would wish to say how the Indians (of the Antilles, and especially those of Hayti) know well how to gild the little things they make of copper very yellow like gold. They have in this such skill and excellency, and give such a deep lustre to that which they gild that it seems to be good gold of 23 carats or more by its color when it leaves their hands. This they do with certain herbs, and it is such a great secret that whoever of the goldsmiths of Europe or of any other part shall find it out, he will be a very rich man, and that in a very short time if he uses this manner of gilding." The old historian of the Indies made efforts to learn from the Indians this secret process, but they excused themselves on the plea that the herbs made use of were unknown

to them, and that the small quantity they possessed came to them from very distant countries.

"It is not impossible," says Holmes, "that an acid may have been applied which tended to destroy the copper of the alloy, leaving a deposit of gold upon the surface which could afterwards be burnished down. . . . It is possible that the film of gold may in some cases be the result of simple decay on the part of the copper in the alloy . . . but the surface in such case would not be burnished, whereas the surfaces of the specimens are all neatly polished."

Writing about the year 1690, the Navigator Dampier describes a method of metal coloring in use in the Philippines. "The natives of the Bashee Islands," he says, "wear large ear rings of yellow metal. Whether it was gold or not I cannot positively say; I took it to be so; it was heavy and the color of our paler gold. These rings when first polished look very gloriously, but time makes them fade and turn to a pale yellow. Then they make a soft paste of red earth, and smearing it over the rings, they cast them into a quick fire, where they remain till they be red hot; then they take them out and cool them in water and rub off the paste and they look again of a glorious color and luster."

To return to the gilded metal work of Central America, considering it probable that a germ truth lay in the information given by the Indians to Oviedo, the writer made several experiments of a simple character in the hope of clearing up the point. It was found that by acting on a gold-copper alloy with dilute nitric acid, a black, lustrous film of gold could readily be obtained by removing in solution a portion of the copper. By heating the object thus treated out of contact with the air, the black film of gold is annealed, changing into the yellow modification, and is left in a condition to be readily burnished with any suitable implement, for example, a water-worn pebble of quartz.

The mineral acids being, presumably, unknown to the craftsmen of pre-Columbian America, advantage was taken of the solubility of copper in organic acids in the presence of air, to obtain a similar result, and after a few successful preliminary experiments with the pure chemical experiments, various acid plant juices, the "herbs" of Oviedo's Indians, were tried, and fully answered expectation. The action depends on the solution of a constantly reformed film of copper oxide by the acid, the object undergoing the treatment being kept continually moist with the re-agent. There can be little doubt that the Indians had no need to ransack "distant countries" for the wherewithal to gild their ornaments; but every craft has its mysteries. It was further found that among the various organic substances tried in the course of experiments, few effected the required re-action so readily as urine, which, with free access of air, rapidly covers the surface of the alloy with a coating of hydrated copper salt easily soluble in acid plant juice.

When performed with the aid of these natural re-agents the operation is a very tedious one, the gold film, in the case of base alloys, taking months to acquire sufficient substance to admit of being burnished; but time signifies little to the savage.

In conclusion, although not desirous of affirming that the procedure outlined above was that invariably followed by the Indians in the production of their gilded work, for, in the total absence of direct evidence it must remain a conjecture, the writer is decidedly of the opinion that their operations broadly followed the lines indicated in the present paper.

COPPER-NICKEL ALLOYS*

The Influence Exerted on the Character of Alloys by the Degree of Purity of Their Constituent Metals.

By A. H. Hiorns.†

EFFECTS OF IMPURITIES ON ALLOYS.

On studying the literature of any alloy, very diverse properties are sometimes given by different authors, and this may arise from the fact of the alloying metals being far from pure. In order to ascertain the true character of an alloy the constituent metals must be absolutely pure, as the presence of foreign elements practically alters the character of an alloy, in some cases even when the foreign element is present in very minute quantity, especially in elements which have a lower melting point than the metals which are designed to be alloyed. The foreign elements may exist as separate entities, or in chemical combination with one or both metals, or as isomorphous mixtures, or they may exist in simple solution. A foreign element may, and often does, cause segregation to take place and thus prevents uniformity in composition. In other cases it unites chemically with one of the metals and increases the hardness and brittleness of the whole alloy. In some cases a small quantity of a foreign element produces an advantage for certain purposes by forming a chemical compound. Such is the case of phosphorous in bronze and arsenic in copper. The foreign element sometimes exists in different forms according to the rate of cooling. By slow cooling it may separate completely from the alloy and form a mechanical mixture. This is usually accompanied with a decrease in strength because the particles of the foreign element prevent perfect continuity of the particles of the alloying metals. In some cases the foreign element acts as a deoxidiser, as in the case of manganese or magnesium in nickel. If we can extend to fusion the well-known laws of solution, and if we apply these results to alloys, we may from the curve of fusibility determine the constitution of the alloys by recognizing whether, after solidification, they are constituted by the simple juxtaposition of the crystals of the metals, or whether they are formed of definite combinations, or are isomorphous mixtures.

NICKEL AND ITS IMPURITIES.

Nickel, that is the commercial form, is not pure, the chief impurities being sulphur, iron, carbon and silicon. Of these, iron and carbon are often the greatest in amount, the carbon being found chiefly in the free form as graphite and in a smaller degree as combined carbon depending like iron on the rate of cooling. The tendency for the carbon to assume the graphitic form is probably the main cause of the inability of such carburised nickel to assume a hardening form, like steel. Possibly a carbide of nickel exists, corresponding to the iron carbide Fe_3C, for when common nickel is alloyed with copper and the alloy dissolved in nitric acid an insoluble residue is left. Whenever such a residue is present in cupronickel, the alloy is always much less ductile than when pure nickel is used. This residue may be a double carbide of nickel and iron. Now in iron, while carbon makes it weaker, it is the combined form which makes it hard and brittle. The same remarks apply to nickel, and if it were not for the great tendency of carbon to separate from nickel as graphite, it would have a much greater

*Paper read before the Birmingham Metallurgical Society.
†Professor of Metallurgy Birmingham Technical School.

embrittling effect and common nickel would be practically non-malleable.

Another element which is said to have an embrittling effect on nickel is arsenic. Schnabel states that 0.1 per cent. of arsenic in nickel renders it incapable of being rolled. If this is the case, most commercial nickels are unsuitable for making cupro-nickel which is required to undergo drawing processes and in fact good results can only be obtained by using practically pure copper and nickel for cartridge cases, which have to be passed through a series of draws without annealing. Arsenic is practically always present, from traces up to an appreciable amount.

Sulphur is another element which should be absent from nickel which has to be pressed and rolled, and as commercial nickel often contains sulphur it is unsuitable for purposes where extreme ductility is required. The following are two analyses recently brought under the author's notice:

TABLE I.

	Carbon.	Silicon.	Sulphur.	Iron.	Copper.
English	0.12	0.056	0.031	0.38	0.02
German	0.17	0.171	0.060	0.20	0.04

Iron is always present in commercial nickel. It hardens, whitens, increases the strength, but reduces the elongation of cupro-nickel and German silver. It is very probable that carbon and iron are the chief factors in rendering nickel brittle, either alone or by their influence on other impurities, thus confining its use to the production of German silver and nickel anodes for plating. Manganese is an advantage as a deoxidiser, but has a weakening effect if present beyond the purpose named. Sulphur in small quantity is rendered practically harmless in the presence of manganese, manganese sulphide being formed.

An 80 to 20 per cent. cupro-nickel when cast, made with German nickel, gave 13.39 tons per square inch and 17 per cent. elongation. A similar alloy made with English nickel gave 14.68 tons and 37 per cent. elongation.

TABLE II.

Various Analyses of Commercial Nickel.

Name.	Copper.	Arsenic.	Antimony.	Cobalt.	Iron.	Sulphur.	Silicon and Carbon.	Lead.	Zinc.
American	.12	.03	.03	—	.5	—	1.17	.01	.6
French	.1	—	—	1.6	.25	.04	.25	—	—
English	.06	—	—	1.5	.65	.15	.27	—	—
Silesian	.34	.01	—	.2	.4	—	.86	—	—
Shot	.13	.05	.03	.5	.5	—	—	.07	—
Electro	.03	—	—	.7	.45	—	—	—	—

Formerly commercial nickel was much more impure than the above, the nickel being not more than 94 per cent. and the copper and iron relatively high. Other impurities also exceeded 1 per cent. Practically at the present time all the makes of nickel, whether shot, cube, rondelle or other forms, resolve themselves into three grades, viz.:

I represents the English, French, German and other continental types for German silver and general purposes.

II represents the best makes of commercial nickel produced by the reduction of the oxide.

III represents a special English make, produced by the Mond method. To these three may be added a special quality of commercial nickel produced on the continent and containing a known percentage of manganese, varying from 1 to 5 per cent. Thus a 4 per cent. manganese alloy would be 95 nickel plus 1 per cent. of impurities.

TABLE III.

I.	II	III
98.99.	99.5.	99.9 per cent. nickel.

An average analysis of each grade would be:

	Nickel and Cobalt.	Cobalt.	Iron.	Manganese.	Copper.	Silicon.	Carbon.	Arsenic.	Sulphur.
I.....	98.76	1.0	.48	.17	.12	.09	.2-.3	trace	.06
II....	99.53	0.4	.2-.3	.05	trace	.15-.2	.05	trace	.02
III..	99.91	0-.01	.07	—	.01	trace	trace	trace	trace

TABLE IV.

Alloys of Copper and Nickel.

Copper 98, nickel 2.	Tubes, locomotive boilers.
Copper 95, nickel 5.	Projectile bands.
Copper 90, nickel 10.	Electrical resistance purposes, bullet envelopes, rifle and pistol ammunition.
Copper 85, nickel 15.	Also in America for solid drawn tubes.
Copper 80, nickel 20.	plumbers' fittings, etc., where whiteness of color and non-corrosive properties are an advantage over nickel-plated brass tube.
Copper 75, nickel 25.	Coinage purposes.
Copper 70, nickel 30.	Electrical resistances, in the form of tape
Copper 60, nickel 40.	or wire, in fact the whole series from 95 copper and 5 nickel to 52 copper and 48 nickel are much in use by electrical resistance instrument makers.
Copper 28, Nickel 70, iron 2.	A new metal produced in America. It is called "Monel" metal. It is a natural product in the reduction of certain copper-nickel ores.

(To be continued.)

NOVA SCOTIA MARKET FOR METAL BEDSTEADS.

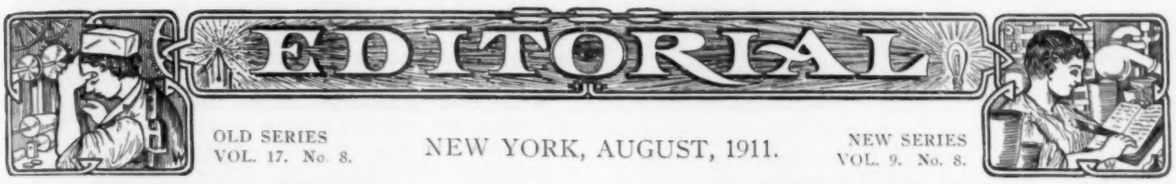
[From United States Consul John E. Kehl, Sydney.]

Up to the latter part of 1907 only American-made brass beds were sold in Sydney, but the Canadian manufacturers have since then captured the trade by reducing their prices, by offering brass beds of American design, and by using best English lacquer, claimed to be superior to American varnish. Canadian-made white enameled beds, with brass caps and rods, headpiece 57 inches high, foot 42 inches, 3/16-inch railings, and 1 1/16-inch pillars, retail at $3.60. Brass beds, with 2-inch posts, cap tops, 55 inches high, finished with 5-ply English golden lacquer, retail at $18.

The possibility of opening American trade relations with Cape Breton depends on the ability to compete in price and quality with the Canadian-made article. There is no local prejudice against articles of American manufacture; if anything, there is a preference. It is suggested that when corresponding with firms net and gross weights be given, also cubic measurement of the bed crated for shipping. [Addresses on file in the Bureau of Manufactures at Washington, D. C.]

ENGLAND BUYS AMERICAN INSTRUMENTS.

Great Britain more and more sends to the United States for scientific instruments. In 1909 the British imports of such apparatus amounted to $3,965,000, of which $1,018,870 came from France and $1,056,220 from the United States. In 1910 the imports amounted to $7,595,000, of which France furnished $1,538,986 and the United States $3,804,400 worth.



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CONTENTS

THE ADULTERATION OF OILS

The information contained in the paper on "The Detection of Mineral or Resin Oils," by Alexander C. Outerbridge, Jr., published on page 334 of this issue of THE METAL INDUSTRY, should prove valuable and interesting to many. This paper was read at the meeting of the American Society for Testing Materials at Atlantic City, June 27-July 1, 1911, and evoked a great deal of interest. The subject of adulteration of oils is a large one, and one that commands the attention of practically every industry. There is probably no commercial commodity that offers such a tempting and practically safe opportunity for dishonest practices. The chemistry of oil is complicated, and it is difficult to make accurate analyses even for the most expert analyst. A mixture of vegetable and mineral oil is somewhat baffling to dissect, and those who have been confronted with the problem will appreciate the importance of Mr. Outerbridge's discovery and give him full credit for the patriotic feelings which have prompted him to give his method to the world without thought of recompense.

While Mr. Outerbridge was at work on the problem, he inquired of Dr. H. W. Wiley, Chief Chemist of the United States Department of Agriculture, and others, among which was the Chemist of the Pennsylvania Railroad, if they knew of any method whereby the presence of mineral oil in large or small quantities in another oil could be detected in a short time. These gentlemen replied that they knew of no method other than the long and complicated ones of proximate analysis. Mr. Outerbridge now gives us a method by the use of which a boy or one with no knowledge of chemistry whatever can at a glance detect the presence of so little as nine cubic centimeters of mineral oil in 990 cubic centimeters of another oil! The value of this method will be fairly appreciated when the difference of price between the varieties of vegetable and animal oils and the mineral oils, so commonly used in their adulteration, is considered.

In this connection we remember a case where a concern was using a large amount of pure lard oil for dressing iron molds in which brass was cast. The chemist in making a casual examination of a new shipment found that he did not get as high a saponification value as in former lots. He went further and found, after a week's work, that the oil in question was heavily adulterated with a mineral oil, and that the mineral oil had been "debloomed." In the meantime, owing to the fact that the oil was giving good results in the casting shop, the oil was being used up! It was found after the chemist had substantiated his

suspicions that the mixture had practically as good a body for its purposes as though it were all lard oil. The only fraud in this case was the question of price, and that was adjusted only after considerable consultations. Had Mr. Outerbridge's method been known, at the time, the test could have been made on receipt of the shipment, the discovery made and the oil rejected without using and a settlement made on the spot.

We hope Mr. Outerbridge's method will stand the test of time and that it will be adopted in many works. While he speaks of it in reference mostly to core oil adulteration, we have no doubt its field will widen.

OLD METAL SPECIFICATIONS

In line with the specifications for copper, zinc and manganese bronze proposed by the American Society for Testing Materials, as published in THE METAL INDUSTRY July, 1911, a set of specifications designed to govern the purchase and sale of old metals, has recently been formulated. These proposed specifications cover copper scrap in various forms, brass and composition scrap, and are as follows:

Copper, Heavy, Cut and Crucible.—This shall consist of any copper not less than 1/16 in. thick, free from foreign substances, except that a small percentage may have solder marks on it, but no lumps of solder, and shall be cut up in pieces about 5 in. wide and 10 in. long. This shall be the maximum size. If cut up in small pieces it will be considered crucible copper. This description applies also to uncrucible heavy copper, except as to its being cut up in pieces.

Copper Wire.—It shall be free from all insulation and from hair wire; also from other metals, such as brass and solder, and from other foreign substances.

Light Copper and Bottoms.—These shall consist of the bottoms of tea kettles, wash boilers, and hot water boilers.

Heavy Brass.—This material shall consist of any solid pieces of brass small enough to go into a 6-in. opening. The approximate mixture of this is 65 per cent. copper and 35 per cent. spelter. This, of course, varies; sometimes copper is a little lower, but it is usually higher. It shall be free from iron and other foreign substances.

Light Brass.—It shall consist of material like lamp tops, and may have a small percentage of iron that is not easily removed. It may also have some traces of solder on it, but not very much.

Heavy Machine Composition.—This is sometimes called red brass, and shall consist of metal that contains a greater or less percentage of tin, and is usually about 80 per cent. copper with a small percentage, sometimes, of lead and zinc. The best grade of composition is composed of copper tin and a small percentage of spelter and a small percentage of lead. But it must always contain not less than 5 or 6 per cent. of tin; the smaller the percentage of tin, the less valuable it is. It is marketable in any form, but has greater value if in pieces that are small enough to go into a 6-in. opening. Steam valves and similar articles, also engine bearings, come under the head of composition.

Owing to the complex and varied conditions existing in the scrap metal trade, it would seem to be an excellent thing if some such specification as the above could be adopted and made standard. We doubt, however, if any such happy condition of affairs in the scrap metal business could be arrived at. Every operation in scrap metals being a proposition in itself, and standard specifications would, we believe, apply only in very general cases. THE METAL INDUSTRY would be glad to hear from consumers and dealers on the subject.

NEW BOOKS

APPLIED ELECTROCHEMISTRY. M. deKay Thompson, Ph.D., Assistant Professor of Electrochemistry, Massachusetts Institute of Technology. Size, 6½ by 9 inches. 320 pages, including index. 137 illustrations and 58 tables. Bound in cloth. Published by the Macmillan Company, New York. Price, $2.10. For sale by "The Metal Industry."

This book was written to supply a need in the art of electrochemistry, as there was no work in English covering the whole field of electrochemistry and students had either to rely on lecture notes or to refer to the sources from which this book is compiled. It was believed, therefore, by the author, that by collecting in a single column the material that would be comprised in a course of lectures it would be possible to present the subject much more satisfactorily.

The book contains fifteen chapters, together with appendices giving atomic weights, electrochemical equivalents, etc. The subject of electrochemistry is treated both from the practical and theoretical standpoints, a knowledge on the part of the reader of theoretical chemistry being assumed. The work makes a valuable reference book for the practical electroplater and electro-refiner, as both subjects are covered in an admirable manner.

"HOW TO ENAMEL," by Howard M. Chapin. Size, 5 x 7½ inches. Seventy pages, illustrated. Bound in cloth. Published by John Wiley & Sons, New York. Price One Dollar. For sale by THE METAL INDUSTRY.

This book is a treatise on the practical enamelling of jewelry by hard enamels and gives a complete description of and instructions for the various forms of enamelling as practiced in the jewelry trade today. Its aim is to explain practical enamelling in such a way that a novice in the subject will, after a little study, not only understand the fundamental parts of the art, but with a little practice, be actually able to achieve creditable results in one of the most fascinating branches of the jeweler's craft.

We would advise anybody, whether actually engaged in the art of enamelling or only casually interested in the subject, to obtain and study the book. To the jewelry trade at large the art of enamelling is very little understood, and a few minutes devoted to this book of Mr. Chapin's will give anyone a clear and complete understanding of the process.

ELECTROPLATING. Henry C. Reetz. Size, 5 by 7 inches. 99 pages, including index, with 62 illustrations. Bound in cloth. Published by Popular Mechanics Company, Chicago, Ill. For sale by "The Metal Industry."

This little book is one of the series of handbooks on industrial subjects being published by the Popular Mechanics Company, and is written like the rest of these books—"so you can understand it." The book is intended as a treatise for the beginner, and also for the most experienced electroplater, and is full of brief and practical directions which are calculated to be a benefit to those already engaged, as well as to those about to engage in the electroplating business. No more technical detail is given than is necessary for practical working, and such explicit directions are included concerning the actual operations that it is possible that a man of average skill by a perusal of the book may become expert along certain lines.

TRANSACTIONS AMERICAN ELECTROCHEMICAL SOCIETY. Vol. XIX. 1911. Size, 6½ by 9 inches. 390 pages. Published by the American Electrochemical Society, South Bethlehem, Pa.

This book is the report of the proceedings of the American Electrochemical Society for the year 1911, and includes the report of the nineteenth general meeting held in New York City April 6, 7 and 8. The work includes a complete list of the papers read before the society at its various meetings during the year. The book is supplied free to members of the American Electrochemical Society.

NICKEL PLATING

To the Editor of THE METAL INDUSTRY:

My replies to "Electro" have caused us to deviate from the original points that were under discussion and I will therefore make this my last letter on the subject. "Electro's" last letter states that in the presence of nickel sulphate any ammonium hydrate is decomposed and nickelous hydroxide would be formed. I cannot see how this is possible as the nickleous hydroxide is soluble in ammonium hydrate and if, as "Electro" claims, the ammonium hydrate is decomposed the nickelous hydroxide being insoluble in water will be precipitated. Should such a reaction take place it is obvious that more nickel would be precipitated than would be replaced by the anodes and there would be an appreciable loss of nickel when the solutions are cleaned.

Bertram Blount in his book on Practical Electro-Chemistry states that Dr. Forester refined nickel from the sulphate solution with excellent results and remarks further in speaking of the double sulphate solution: "The bath tends to become alkaline in working, because of the ammonium sulphate as well as the nickel sulphate becoming decomposed and yielding ammonia at the cathode." He states that this alkalinity should be neutralized from time to time by the addition of sulphuric acid. Other recent experimenters have advanced the same arguments based on nickel solutions and not on solutions that are essentially different.

Tin solutions may be known that will become completely regenerated from the anode but, as "Electro" states, the deposit is not satisfactory. Presumably I must be always controverting "Electro's" statements and I now state positively that it is possible to obtain a silver white deposit of tin of considerable thickness, and that this is being done on a large scale commercially in many places. The solution does not completely regenerate from the anode however.

It does not seem strange to me that Dr. Adams failed to see the advantages in the sulphate electrolyte. He might have patented any other double sulphate or the fluo-silicate, but the fact remains that he did not and this in no way reflects on his abiblity. We might as well wonder why any improvement is made in electro-plating, because if all the pioneers struck the proper combination and the best in every instance there would be no need for further study or research. Hall was the pioneer in the aluminum industry but we cannot say that no progress has been made since he first obtained his patents nor can we claim that his process has not been modified and improved upon.

To return to the original question. In my article* I urged standardization of plating conditions and gave general directions for taking care of a nickel solution, assuming that all nickel platers had not reached the stage where no troubles are ever encountered. Now "Electro" assumes that conditions are in general well standardized and I can only say that from the inquiries constantly appearing in trade papers, and from letters that I have received, that this is decidedly not the case. Those whose conditions are so well controlled as "Electros" would gain but little from my paper, but it is possible that others would be benefited and it was to "the others" that my paper was directed.

In conclusion I would remark that all the arguments against the "single salt" of nickel have convinced me that to the thinking man it has been clearly demonstrated that the "double salts" have no superiority. It has been clearly shown that if the double salts are decomposed ammonium hydrate is formed. If no further action takes place there is danger of the solution becoming alkaline while the single sulphate solution is free from this objection. It has been shown that the latter salt is much more soluble than the former, also that it can be used at greater density, will stand a higher current density, and work can be plated in a shorter time. If the double salts are broken down as claimed by "Electro" a considerable amount of current is required to decompose the ammonium hydrate and this means lack of efficiency, or to put it in a different light, if one ampere will deposit 1.095 grams of nickel in one hour from the sulphate solution, and if some of this current must be used to decompose the ammonium hydrate in the double sulphate solution; the deposit made by one ampere will be less than the theoretical 1.095 grams. Therefore if the deposit is less it will require more current for the same length of time or the same current for a longer time. If this is not low efficiency I am at a loss what to call it. To my mind "Electro" has, in speaking against the nickel sulphate electrolyte, advanced the strongest arguments in its favor, although his premise has been wrong in support of his arguments.

Oak Park, Ill., July 1, 1911. PERCY S. BROWN.

*THE METAL INDUSTRY, January and February, 1911.

VALVE MANUFACTURE

To the Editor of THE METAL INDUSTRY:

We have read with much interest the article in your issue of April, 1911, entitled "Early and Late Days of Valve Making." There are many truths covered by this article, and we can safely say that we agree with a very large part of it. There is one point, however, that we feel we must take issue with the writer, and that is the latter part of the article reading as follows:

"You might say that the valve makers should use only new metal in their valves. Well they don't; that is all there is to that. There is some junk used in all, and as I have shown, there is danger in all junk."

Whereas we know for a fact that there are a great many people in the valve business that do use junk such as the author states. The bronze or brass which has been used by the Ludlow Valve Manufacturing Company in manufacturing valves in the 35 years of its existence, and is now being used by said company in the manufacturing of valves, has been made entirely from new material mixed in their own foundry, no junk of any nature ever being purchased or used.

THE LUDLOW VALVE MFG. CO.,
James H. Caldwell, President.

Troy, N. Y., May 6, 1911.

CENTRIFUGAL DRYING

To the Editor of THE METAL INDUSTRY:

In further reference to centrifugal drying with a hot-air blast, the class of goods to which I referred* as being dried in 3 minutes at a works in Barmen, includes eyelets and glove-fasteners, the latter being hollow. I fail to see anything very mysterious about the elimination of moisture at a temperature exceeding 212 degs. F. which is attained by the articles being dried, even if the air-blast remains well below that temperature. Even if we suppose that centrifugal force will hold steam in a cavity, what will happen to it the moment the centrifugal is brought to rest?

In this process, the bulk of the moisture may be removed by centrifugal force, but the last film is held to the surface by a force of cohesion which is greater than the centrifugal force tending to remove it; this is due to the infinite lightness of the film; therefore, at ordinary temperatures the film disappears by simple evaporation, leaving a dull and spotted surface. It takes a Tolhurst 20-mile breeze at 200 degs. F. to blow the freckles off. It seems to me that sufficient "hot-air" has been expended to consider the subject as thoroughly dried out. ALFRED SANG.

Paris, July 25, 1911.

*THE METAL INDUSTRY. June, 1911.

THE FOUNDRYMEN'S CONVENTION

To the Editor of THE METAL INDUSTRY:

Referring to Dr. Moldenke's letter in the July number of THE METAL INDUSTRY, I have read it with a great deal of interest, and believe that the questions which he raises there are very liable to come up. As the Buffalo situation regarding the next convention is more or less in the limelight at the present time, I can form no definite opinion until a little later on. I should very much regret to see any feeling of hostility arise between the various associations, and do not feel that this is at all necessary, if the situation is talked over frankly.

W. M. CORSE,
Secretary-Treasurer Amer. Brass Founders' Ass'n.

Buffalo, N. Y., July 18, 1911.

Shop Problems

IN THIS DEPARTMENT WE ANSWER QUESTIONS RELATING TO SHOP PRACTICE OF THE METAL INDUSTRY. ADDRESS THE METAL INDUSTRY.

BRAZING

Q.—Do you know of any compound for use in brazing which will prevent the adherence of brass to parts which are brazed?

A.—Our efforts to determine what this material might be have been unsuccessful. If it is a liquid we should say sodium silicate. This substance must be either borax or boracic acid, unless it is something of a vitreous nature that would be easily soluble afterwards.—C. H. P.

COLORING

Q.—Is there any way whereby I can govern the color of the smut from my rose-gold solution and if so please state how?

A.—If carbonate of potash is added to an ordinary fine-gold solution, a red rose will be obtained; if phosphate of soda be added, a yellow rose will result, so by adding either of the above chemicals a rose-gold solution can be easily governed.

The color of the deposit can also be regulated by the current, a high voltage burning on a red smut, while a low one will produce a light, fine-gold color one.—O. A. H.

Q.—Can you give me a formula for producing a brown color on polished steel without heat or plating?

A.—The following formula used by the U. S. Ordnance Department will probably accomplish your purpose:

Alcohol	1½ ozs.
Tincture of iron	1½ ozs.
Corrosive sublimate	1½ ozs.
Sweet spirite of nitre	1½ ozs.
Sulphate of copper	1 oz.
Nitric acid	¾ oz.

Mix together and dissolve in 1 quart of warm water and keep in a glass jar. Cleanse the surface of the metal with the usual alkalies, such as soda or potash, then dry the surface. Apply some of the mixture with a sponge or rag and expose to the air for twenty-four hours, when the loose rust should be rubbed off with a steel scratch brush, using care not to use too much pressure. One or two applications and brushing may be necessary to obtain the desired results; finally immerse in boiling water for a few seconds, then dry quickly and wipe with linseed oil or apply a thin coat of French varnish lacquer.—C. H. P.

DEPOSITING

Q.—We want to get a heavy deposit of nickel, about 1/16 in. thick. Can you give us a formula of this solution? We have a sample of a deposit which was made in ten hours, and it is ⅛ in. in thickness. The party that made this deposit states that he can make it any desired thickness so long as the current is not interrupted. Any long interruption would be likely to show its effects in a separation of the two layers of metal. There is absolutely no mechanism of other mechanical machinery connected with the process, but it is all in the electro-chemical part.

A.—A solution for such a purpose as required by you should consist as follows:

Double nickel salts	6 ozs.
Single nickel salts	3 ozs.
Sal ammonia	4 ozs.
Boracic acid	¼ oz.
Water	1 gal.

This formula should give you any desired thickness, providing the proper regulation of the current is taken care of. Any good formula should give the same results providing as you state the current is not interrupted too long. To prevent the separation of the layers when the current is interrupted for any length of time, prepare a solution of muriatic acid, consisting of ten parts acid and ninety parts water. Arrange this acid solution as a plating tank, but connect up reversedly so that the polarity is just the opposite to plating. Use three poles, the two outside ones as the negative poles. Place nickel anodes in these and connect the center pole with the positive in plating for heavy deposits. When the current is interrupted remove the articles before putting them in circuit again and immerse for a minute in the reversed acid bath. This will remove any oxidization upon the surface and produce a continuous deposit without danger of separation. A good strong current should be used in connection with this acid bath.—C. H. P.

ETCHING

Q.—Can you advise us what solution and what resist is best adapted for etching aluminum?

A.—For an etching ground or resist there is nothing better than asphaltum varnish. This can readily be thinned down to the proper consistency with turpentine. Hydrochloric acid, reduced with water, will be found to give the best results for etching aluminum. Hydrofluoric acid can also be used when diluted, but as this acid attacks glass it is more difficut to contain it for use. The etching varnish can readily be removed with turpentine, benzine or gasoline without affecting the color of the metal.—C. H. P.

FINISHING

Q.—Will you please give me a formula for a color the same as hammered brass, to be used on a plain surface?

A.—The majority of hammered brass is finished in what is known as brush brass. This finish is produced in various ways. A simple method is to cut down the surface of the metal with a regular buff using tripoli as the cutting medium, then cleanse the surface and brush over with a brass wire scratch brush, using powdered pumice stone and water, producing the opaque effect. Then wash dry and lacquer. The next method is to cut down the surface as mentioned above and then to deaden by using a tampico machine brush, run at about 500 revolutions per minute, using pumice stone, mixed with lard oil to a paste, applying a little to the work and brushing over. The articles are then cleansed in benzine, dried and lacquered.

Some hammered brass work has a brownish or burnt appearance, but this is difficult to produce upon plain work. There being no uneven surface the contrast effect cannot be carried out. You can produce a brown tone by immersing the articles in a hot solution of sulphuret of potassium, using two to three ounces to each gallon of water. The first immersion of the article produces a deep orange color, wash and immerse in a solution containing

2 ounces of sulphuric acid to each gallon of water. Use this cold. After this immersion re-wash, dry the articles and then scratch brush, using soft brass wire brush. If the tone is not brown enough repeat the operation a second time. After the second finishing and brushing relieve the surface a little to give it a shaded effect, using the hand for the purpose and a little pumice stone mixed with water, afterwards wash and then lacquer the surface.—C. H. P.

GALVANIZING

Q.—Could you give us any suggestion that will help to remedy the trouble we have with our galvanizing solution? We plate mostly cast iron and find that the zinc deposit is streaky.

A.—From the appearance of the galvanized iron sample submitted to us for inspection we arrive at the following conclusion: Your solution has become too acid by constant use. This causes too great an evolution of hydrogen, producing streaks and consequently a burnt appearance of the deposit. To overcome this trouble add two ounces of common alum to each gallon of solution. This should be in a powdered form and should be dissolved in as little boiling water as possible for solution. This will neutralize the free acid, forming the toning solution. If this addition does not overcome your trouble add from four to eight ounces of sulphate of zinc, which is the galvanizing salt and will increase the metal content of the solution. It would also be advisable to increase the voltage to 4 as 2 to 2½ is very low for this deposit.—C. H. P.

HARDENING

Q.—Will you kindly let me know through the Shop Problems columns if there is a method to harden sheet aluminum. The aluminum always gets softer and stays soft after it has been heated. I weld aluminum hollow-ware, but the goods are too soft after welding.

A.—There is no method by which you can harden aluminum except by pressure such as is exerted in rolling or drawing. As your metal is already finished in sheet form, the heat that you apply acts as an annealing process and, of course, softens it up. We can suggest no remedy other than to use a stiffer and harder alloy to make your sheet of.—K.

NICKELING

Q.—Our nickel deposits come out dark gray and rough after one and one-quarter hours deposit. The solution stands at 10 deg., and we have always added single salts. Can you suggest a remedy?

A.—According to the American standard of density for still nickel solutions your solution is too concentrated. In America solutions that register 5½ to 6 deg. Baumé give the best results, providing the metal content of the solution is correct. Concentrated solutions produce dark deposits that readily stain the deposit and often cause peeling. We would suggest that you reduce your solution to 5 deg. with water, saving the solution removed to make future additions, as long as you have been using single salts. Then add to the solution reduced by water, 4 ounces of sal ammoniac in powdered form to each gallon. This addition will increase the conductivity of the solution and give you a smoother and brighter deposit. Nickel solutions always give better results when they are very slightly acid. To increase the acidity of the bath add a few ounces of oil of vitriol to a quart of water and add to a 100-gallon bath. Four or 5 ounces of the acid will be sufficient.—C. H. P.

PITTING

Q.—My nickel solution stands between 6 and 7 deg., and is plating dark and pitting the work. What can I do to overcome the pitting and obtain a nice, white deposit?

A.—The trouble you experience from a dark and pitted deposit is due to occluded hydrogen. This trouble develops when the solution is low in metal and hydrogen gas forms very rapidly upon the surface of the articles being plated. This gas theoretically burns holes in the deposit, causing the pitting noted. Because a solution registers 6 to 7 deg. Baumé does not prove that the solution contains the proper proportion of metal. According to the density of the solution any material that is soluble in water increases the density, so your solution might contain nearly all ammonia salts, such as ammonium sulphate and scarcely any metal whatever, and still register 6 to 7 deg. This is the fallacy of the Baumé scale when used in connection with the true determination of the contents of any metallic solution. We suggest that you reduce your solution to 5 deg. Baumé, then add from two to three ounces of single sulphate of nickel to each gallon of your solution. This will overcome your trouble and give you a normal deposit.—C. H. P.

PLATING

Q.—I am heavy zinc plating my iron and steel work previous to nickeling so as to produce a rust proof deposit, but find that I cannot deposit nickel directly on the zinc satisfactorily with the regular nickel bath. Will you please give me a formula for the same and also the best copper bath to use in plating on sheet zinc?

A.—When plating zinc with the regular nickel bath the surface becomes black unless an unusually heavy current is used; then there is danger of peeling. The following formula gives good results for zinc:

Nickel sulphate	10	ozs.
Sal ammoniac	10	ozs.
Potassium citrate	6	ozs.
Water	2½	gals.

It is advisable to highly copper plate the articles, although this bath will deposit direct. The bath must be maintained neutral to litmus paper. This is best accomplished by dissolving pure stick caustic potash in water and adding a very little occasionally to maintain neutrality.

A good copper bath for coating zinc should consist as follows:

Cyanide of potassium	6	ozs.
Carbonate of copper	3	ozs.
Bisulphite of sodium	3	ozs.
Water	1	gal.

Use the solution warm, if possible, as it will give better results.—C. H. P.

POLISHING

Q.—I am using leather covered polishing wheels to polish steel parts which have a small shoulder, which have to be well polished in the corners. They are so sharp that they wear out the leather covering on the edges so badly that I have to trim the wood. Is there anything we can apply to the leather to keep it from wearing?

A.—A little tripoli or beeswax applied to the wheel while in motion will help to keep the work from cutting the leather, but skill more than anything else is necessary to keep the sharp edges of the work from cutting. It is not practical to get into sharp corners by polishing; the corners should be filed where they have to be cleaned out and then either sand buffed or cut down with tripoli. This should do for any ordinary steel stamping. For forgings the corners should be either ground or filed. There is on the market a celluloid composition wheel for grinding corners, the use of which will mean an extra operation, but will save time and money, both in wheels and labor.—T. C. E.

VARNISHING

Q.—Will you please give me a formula for a foundry varnish to produce a very smooth and lasting surface on cast iron plates and patterns, or is there a process whereby I can produce the above results?

A.—There is no better coating for cast iron patterns than pure beeswax, put on hot and well polished with a stiff brush. Various mixtures of paraffin with carnauba wax or bayberry wax with tallow have been advocated, but none are equal to beeswax.—J. L. J.

PATENTS

REVIEW OF CURRENT PATENTS OF INTEREST TO THE READERS OF THE METAL INDUSTRY.

995,113. June 13, 1911. ALUMINUM ALLOY. C. H. H. Claessen, Berlin, Germany.

The invention provides an alloy of aluminum which is very light and the same time stronger and of better quality than aluminum alone or of aluminum alloys heretofore known.

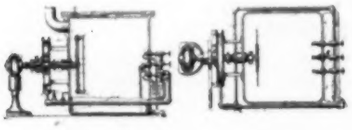
It has been proposed heretofore to increase the quality and strength of aluminum by the addition of magnesium and with very good results, but in such old alloy the amount of magnesium employed has been in excess of two per cent. It has also been proposed heretofore to alloy aluminum with slight percentages of magnesium, copper, iron and zinc. It has been found that an alloy of aluminum of properties far superior to the alloys heretofore known may be formed by alloying aluminum simultaneously with magnesium and copper, it being important, however, that the magnesium shall not exceed two per cent. On the other hand, good results are obtained by using up to five per cent. of copper.

While the proportions of magnesium and copper with the aluminum may be modified to a certain extent so long as the limits fixed by me are maintained, particularly good results have been obtained with an alloy consisting substantially as follows: Aluminum, 95.5 to 95.75 per cent.; magnesium, 0.25 to 0.5 per cent.; and copper, 4 per cent.

995,148. June 13,1911. ETCHING-MACHINE. F. E. Johnston, Pittsburg, Pa.

The primary object of this invention is to provide a simple, durable and effective device, shown in cut, for rapidly and accurately etching plates, by subjecting them to the action of an erodent or etching solution, and instantly checking the action of the latter upon the plate when the etching operation has been completed.

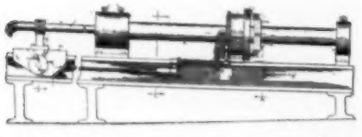
The invention includes a vertically disposed adjustable plate holder rotatably mounted within a casing, and means for rotating and stopping it as desired, as well as means for spraying the plate separately with an erodent solution and with water, without removing it from the holder or altering the position of the latter.



The invention also includes means for impregnating the erodent solution with air under pressure and projecting it against the face of the plate in an evenly distributed spray, together with an improved form of closed etching chamber adapted to hold a supply of erodent solution, and provided with a vent to carry off the fumes generated during the process of etching.

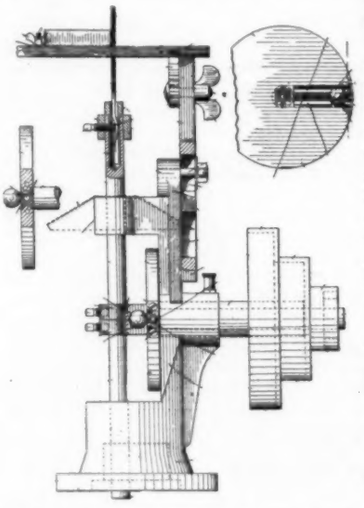
995,572. June 20, 1911. TUBE BORING MACHINE. James Rowe, Chicago, Ill.

The machine shown in cut is designed particularly for boring out brass lined iron or steel tubes used in the construction of molds for casting inking rolls for printing presses but may obviously be employed for boring out all kinds of tubular bodies including guns and other heavy structures. The machine is not, however, designed or intended to be used for boring solid bodies but is designed essentially as a finishing tool for bores previously roughed out in any measure and which it is desired to render true and smooth. The problems presented by this class of work differ materially from those presented in boring out solid bodies. In doing the last named work it does not matter greatly if the shavings scratch and mar the bore, the sole object being to eject them and thus prevent clogging of the exits therefor and consequent jamming to the detriment of progress of the work. In finishing operations, however, a single shaving finding its way back into the finished portion of the bore may so scratch and mar the surface as to completely ruin the device, since reboring would necessarily so enlarge the bore as to make it greater than the desired standard and would, therefore, fail to correct the evil accomplished.



996,329. June 27, 1911. MACHINE FOR FILING AND CUTTING METALS AND OTHER MATERIALS. George Habig, Los Angeles, Cal.

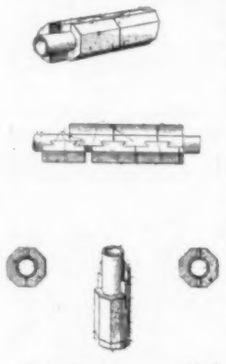
This invention which relates to a new or improved machine for filing and otherwise cutting metals and other substances, is adapted for a variety of purposes, in respect of which filing or cutting operations have to be performed on pieces of metal, wood, stone, insulating substances and other materials, used in a vast variety of manufacturing operations, for example, in factories where electrical fittings and apparatus are made, in gas fitting manufactories.



The machine, shown in cut, consists of a framing which is preferably adjustable in height, and contains a rotating driving shaft by which a recipocating member, namely, the filing and cutting rod of the machine is maintained in reciprocating motion. The extent of this reciprocating motion may be varied by means of a screw in a driving crank device which is operated by the attendant to vary the throw of the crank from time to time as required. The file, saw or other cutting instrument is carried in the upper part of the reciprocating driving rod, and it passes through a hole in the table upon which the material to be filed or otherwise cut is supported during the filing or other cutting operations.

996,926. July 4, 1911. REFRACTORY COVERING FOR METAL PIPES OR TUBES. Joseph Harrington, Riverside, Ill.

This invention relates to improvements in refractory coverings for metal tubes, such as are used for protecting the water tubes of boilers where exposed to the heat in the interior of a furnace, or for protecting other metal tubes exposed to heat.

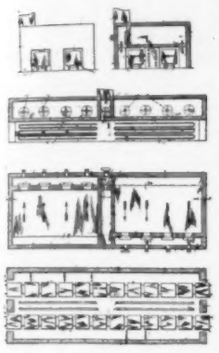


The invention relates more particularly to that class of such refractory coverings, shown in cut, in which the same consists of a plurality of fire-brick or tile sections adapted to fit upon and completely surround or inclose the metal tube to which the covering is applied.

A refractory covering embodying this invention embraces in general a plurality of fire-brick or tile sections, each of which is made of such cross-sectional form as to fit upon and cover a part of the circumference of the tube, and which is adapted for contact of its lateral faces with one or more like sections, and in connection with the same to completely inclose or cover the tube.

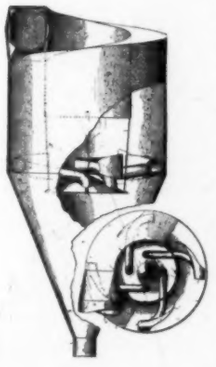
997,092. July 4, 1911. DRYING METHOD. Karl Reyscher, Bielefeld, Germany.

This is a method for drying of various goods by the use of hot air. The method consists in passing the goods in two sections in opposite directions through two currents of air, each current passing over the dried departing portion of one section, then over the heater and then over the wet portion of the other section, whereby the air currents receive the preliminary heat by contact with the dried goods and are then heated by the heater, and finally come in contact with the entering wet goods to quickly dry the same prior to the latter reaching the exit portion of the drying chamber. In order to carry this method into effect, use is made of a drying apparatus, such, for instance, as illustrated in the accompanying cut.



997,171. July 4, 1911. DUST COLLECTOR. J. C. Zehfus, Chicago, Ill.

This invention relates particularly to dust separators of the "cyclone" type, in which the dust-laden air is caused to travel a circular course, so that the comparatively heavy dust particles are separated from the conveying air current by centrifugal force, and are then downwardly delivered to a discharge hopper or funnel, while the cleaned air passes upwardly through a central air outlet.

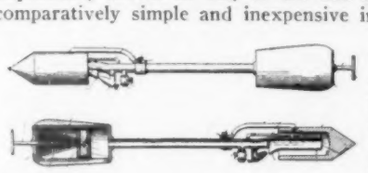


In devices of this class, as usually constructed, the air is directed tangentially into the annular space between a pair of concentric casings, and is thus given a whirling motion about a vertical axis. An important obstacle to the separation of dust from the conveying air current in such apparatus is the fact that the whirling mass of solid particles attains a greatly increased velocity of rotation, as it approaches the contracted outlet of the delivery funnel, and this causes a whirling cloud of the finer dust particles to form in the funnel and rise until it is carried out of the air outlet.

With a view to overcoming this difficulty, the main objects of the present invention are to provide an improved form of dust collector, shown in cut, adapted to efficiently remove the solid particles from a blast of dust-laden air; to provide improved means for avoiding conflicting air currents tending to reduce the efficiency of the dust separation and producing back pressure on the blower, and to provide improved means for returning to the dust outlet the dust which tends to pass out of the air outlet.

997,259. July 11, 1911. SELF-HEATING SOLDERING IMPLEMENT. H. E. Barber, Stamford, Neb.

The object of the invention is the provision of a soldering implement, shown in cut, of the self-heating type of which is comparatively simple and inexpensive in its construction, which is positive and reliable in its operation, and which will operate effectively either in an upright, an inverted, or an inclined position. The invention further contemplates the provision of a soldering implement which need not be connected to a gas or electric main, which can be easily and quickly prepared for use, and which will enable a workman to accomplish much more than with the ordinary soldering coppers in general use.

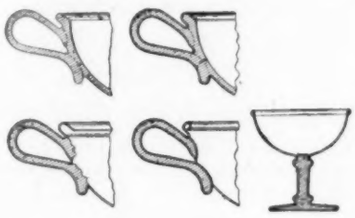


997,799. July 11, 1911. PLATE METAL TUBING. P. H. Friel, Kenosha, Wis.

Among the principal objects which the present invention has in view are: To provide pliable covering material and a rigid body structure inclosed within said covering material and disposed to prevent the opening of the joint of said covering material; to provide a sheet metal tube, as shown in cut, the edges whereof are joined longitudinally and are provided with means for locking the joint to prevent the opening of the same; to provide a locking member for infolding and holding the edges of metal, bent to form a tube, the member being disposed within the tube; and to provide a construction for a plate metal tube which is simple, economical and durable.

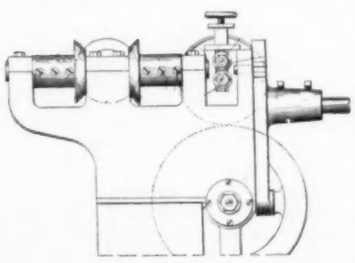
998,085. July 18, 1911. METHOD OF PRODUCING METALLIC VESSELS BY ELECTRODEPOSITION. F. T. Gibbs, Birmingham, England.

This invention consists of improvements in methods of producing metal vessels by electrodeposition, such vessels, for instance, as tea pots, jugs, cups, vases, drinking cups, and the like, which have projecting spouts or handles or legs or stems or bases or other like projecting parts the metallic vessels having been formed by electrodeposition on the prepared surfaces of models of glass or potteryware or other suitable non-metallic and non-porous substance and then removed from such models, so that the body or main portion of the vessel is metal without any glass or potteryware or other non-metallic lining. In order to facilitate the production of strong spouts, handles, stems or bases or the like integral with said vessels the process is as follows: The glass of potteryware or other non-metallic and non-porous model, as shown in cut, is formed with the required handle or spout or legs or stem or the like in a piece, and these are coated with the metallic paint or other conducting material so that the metal will be electrodeposited on these handles or spout or legs or other projecting parts, as well as on the body of the model. But when the body part of the model has been broken away and removed, the potteryware or glass or other handles or spout or other projecting parts of the model will remain permanently embedded in the electrodeposited vessel and at their ends where they have been broken away from the model inside the vase or other article, the glass or potteryware or other part can be ground down and then coated with the metallic or other conducting material and the required metal electrodeposited over these ends of the handles or projections so that they will not show on the inside of the vessel.



998,087. July 18, 1911. MACHINE FOR STRAIGHTENING AND CUTTING WIRE. C. Greiner, New Haven, Conn.

This is an automatic machine, shown in cut, for the straightening of wire and rods and is covered by the following claim: In an automatic machine for straightening and cutting off wire, the combination with the dies thereof, of feed-rolls, a cutter, a cut-off lever, a clutch controlling the transmission of power to the feed-rolls, and connection between the said cut-off lever and the clutch, whereby as the lever moves to bring the cutter [illegible] the clutch to take the power off the feed-rolls.



INDUSTRIAL

NEW AND USEFUL DEVICES, MACHINERY AND SUPPLIES OF INTEREST TO THE READERS OF THE METAL INDUSTRY.

GRINDING WHEELS AND SAFETY

Interest in accident prevention and relief in all its phases is rapidly increasing in volume and extent all over the world. Many progressive manufacturing concerns have established in their plants private systems of relief and prevention which have attracted national attention. Many have issued books on the subject containing rules and instructions to employees for the prevention of accident, and making superintendent, foreman or other men in charge directly responsible for the carrying out of these rules and regulations.

The National Association of Manufacturers of the United States has taken an interest in this subject to the extent of publishing a book entitled "Accident Prevention and Relief," which is a thorough report of an investigation of the subject by Ferd. C. Schwedtman and James A. Emery. This book should be on the shelf for handy reference by every employer of labor. That this subject is one of national importance is evident from the fact that accident prevention institutions are maintained in various cities of the world, notably Amsterdam, Paris, Brussels, Berlin, Munich, Vienna, Budapest, Zurich, Milan and New York. In recent years, important International Conferences have dealt with the important phases of accident prevention, compensation and insurance.

Believing that the old adage "An Ounce of Prevention is Worth a Pound of Cure" very forcibly applies in the matter of protection against accidents, the Norton Company, manufacturers of abrasives and grinding machinery, Worcester, Mass., are preparing to establish in their works, their branch stores and other prominent places, standard exhibits of safety devices as

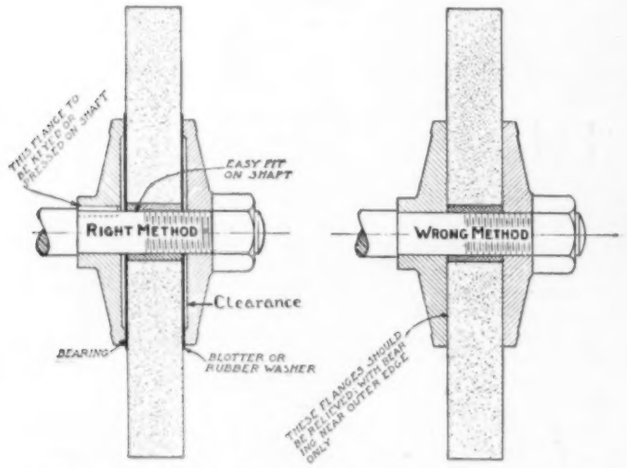


FIG. 1.—THE RIGHT AND THE WRONG WAY OF MOUNTING WHEELS.

applied to grinding operations. One such exhibit is now on display at the American Museum of Safety, 29 West 39th street, New York City.

Some of the valuable points in the setting up and use of grinding machinery are given in a pamphlet issued by the company. The first point taken up, as shown in cut Fig. 1, is the right and wrong methods of mounting wheels. Note in the illustration on the left, relieved flanges with compressible washers between wheel and flange, and a perfect bearing on the outer edge. Note on the right, improper mounting—straight flanges with no washers.

Tightening of the nut causes straight flanges to become slightly convex and instead of the pressure being distributed evenly over the whole bearing surface of the flange it is concentrated near the hole, creating a dangerous condition.

The inner flange should never be left loose on the spindle as in this case, but should be keyed or shrunk on. The rest should be adjusted as closely as possible to the wheel to prevent work from being caught between the wheel and rest.

The next detail called to our attention is the protection hood as shown in detail in Fig. 2, and on a double end stand in Fig. 3. The protection hoods are steel bands that surround the periphery of the wheel and in the case of accident stop the broken fragments. These are claimed to be the only safety device that gives full protection to the operator and those about him.

Grinding rooms should not only be well ventilated and well lighted, but the machines should be attached to a dust system. Besides protection to the workmen, the dust system prevents wear and tear on machinery and belts. A dust system in use at the Norton Company's plants is shown here, Figs. 4 and 5. Akron pipe is used for the main pipe, which is put in the ground and is very durable.

A shield of clear plate glass affords protection to the workman's eyes where fine work is ground and it is necessary for the operator to work close up to the wheel. Where it is impracticable or undesirable to use a glass shield an effective guard may be made of leather. It is nothing more than a leather

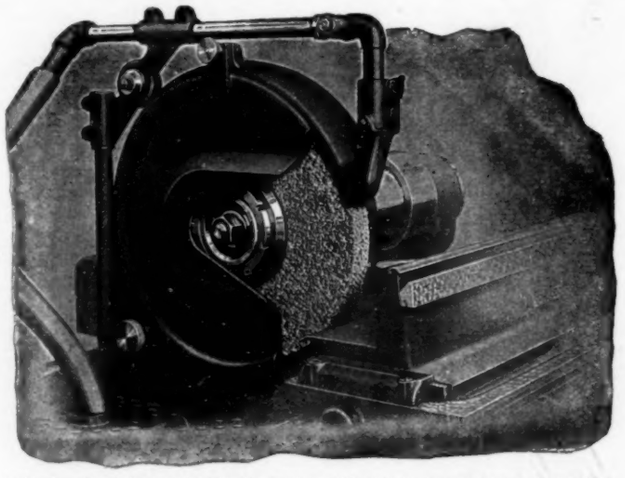


FIG. 2.—PROTECTION HOOD USED ON NORTON PLAIN GRINDING MACHINE.

flap attached to the hood and adjusted so as to interrupt sparks and dust.

SPEED CHANGING.—As a wheel wears down the speed should be increased in order to maintain the same surface rate and preserve uniform condition in grinding. Usually when a wheel is nearly worn out, the spindle is running at the highest speed. If a thoughtless operator takes off the stub of the old wheel and puts on a new wheel without readjusting the belts, an accident from over-speeding may result. To avoid such accidents the Norton Company use a locking arrangement which may be used on cone pulleys.

GENERAL SUGGESTIONS.

The pamphlet closes with some general suggestions which are well worth reading by every one concerned in the operation of grinding wheels:

"The foreman of the grinding department, or his assistant, should examine carefully each morning every grinding machine

in the department to see that the bearings are tight and well oiled, and that the wheels are in good condition. He should examine every wheel before it is put on an arbor.

"The man in charge of the storeroom should carefully inspect every grinding wheel before it is given out to the workmen.

"Competent men should be detailed to mount and true grinding wheels, to adjust rests and regulate the speed.

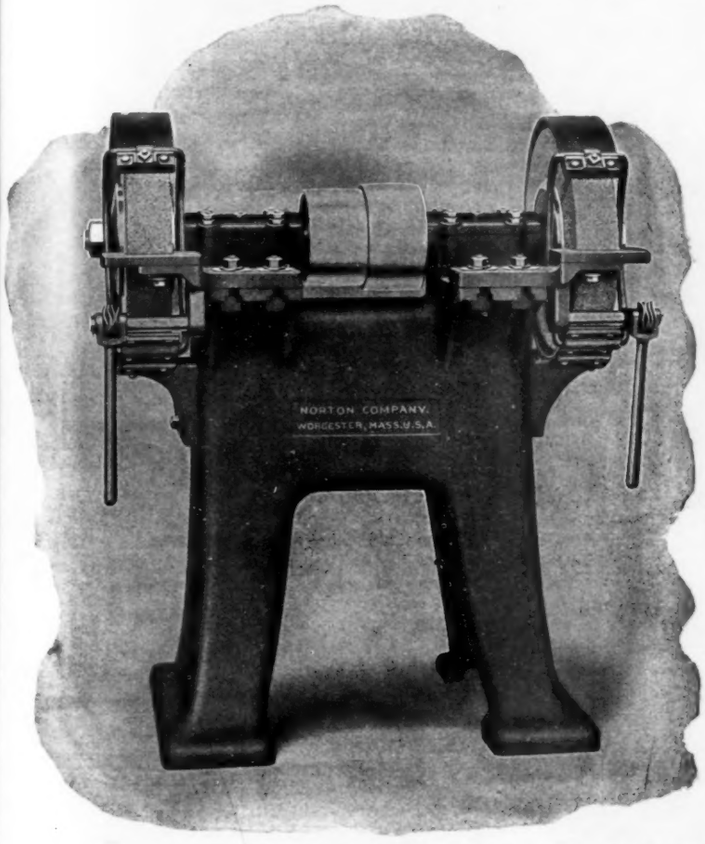


FIG. 3.—GRINDING WHEEL STAND, FLOOR TYPE, EQUIPPED WITH PROTECTION HOODS.

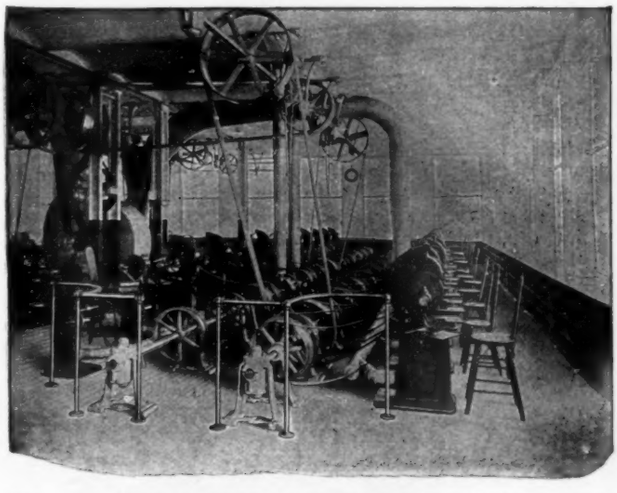


FIG. 4.—A MODERN POLISHING DEPARTMENT EQUIPPED WITH A GOOD DUST SYSTEM.

"Boxes should be well oiled and carefully adjusted.

"Grinding wheels should be stored in a dry place.

"A wheel used in wet grinding should not be left over night partly immersed in the water.

"If a grinding wheel vibrates there is something wrong. You should true up the wheel and re-babbitt the boxes after truing up the journals.

"Keep all rests adjusted close to the wheel so that work cannot be caught.

"Foremen should indicate on each machine the revolutions of spindle and size of wheel to be run upon it.

"Wheels should be handled with greatest care in unpacking, storing, delivering, etc."

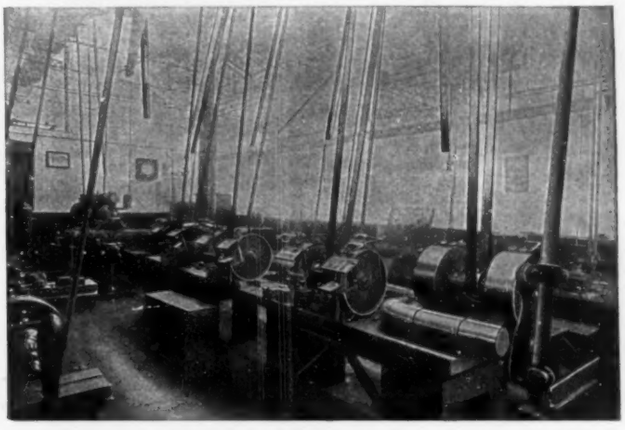


FIG. 5.—A MODEL INSTALLATION OF NAIL DIE GRINDERS. NOTE SAFETY HOODS, PLATE GLASS GUARD, EXHAUST CONNECTIONS AND THE ARRANGEMENT OF LIGHTS.

Copies of the booklet will be mailed upon application to the Norton Company, Worcester, Mass.

HACK SAW DON'TS

Catalog No. 14, issued by the Henry G. Thompson & Son Company, 496 State street, New Haven, Conn., manufacturers of hack and band saws and machines for cutting all kinds of metals, contains the following advice to users of hack saws:

Don't run blades too fast in power saw machines; 40 to 45 strokes per minute accomplish best results. More pieces will be cut in a given length of time than if saw is run faster. Greater speed dulls saws prematurely.

Don't put too much weight on a new saw; begin with weight over fulcrum point and increase moderately. Too much weight dulls saw prematurely. Nothing gained in trying to force saw—in other words, a sharp saw cuts faster than a dull one.

Don't, in a hand frame, run saw too fast; same speed as in power saw machine is best. The same rule applies to hack saw blades as to a file; fast strokes quickly injure cutting edge and you soon have a dull tool. Bear gently on forward stroke; lightly on return.

Don't commence with new saw in old cut where another saw has worn out. If you do, it's liable to stick and work unsatisfactorily; turn work over and begin on opposite side. Blades of same make are liable to vary in thickness, and the set is always wider on new saw, having worn off more or less on an old one.

Don't use oil on Hack saw blades under any circumstances; better results are obtained by using them dry.

Don't use a coarse tooth (or regular cut) saw on solid brass, copper or gas pipe. If you do, the teeth are liable to break out. For this class of work use a "Milford" fine tooth—22 teeth to the inch.

Don't use a coarse tooth (or regular cut) saw on thin sheet metal or thin tubing. If you do, the teeth are liable to break out. For this class of work use a "Milford" tubing saw—32 teeth to the inch.

Don't use anything but a coarse tooth (regular cut) "Milford" hack saw on solid steel or iron. No saw on the market today has as much endurance; none stronger or tougher; none cut smoother or faster, all of which can be demonstrated by an impartial test.

A MODERN METHOD OF CLEANING SMALL CASTINGS

A Description of a New Apparatus for the Economical Handling of Large Quantities of Work.

By A. G. Warren.

A sand blast tumbling barrel outfit, with double hose sand blast machine, sand separator and suction hoppers, designed and built by J. W. Paxson Company of Philadelphia, is shown in the accompanying illustrations. Where it is desired to thoroughly clean large quantities of small brass, gray iron, or malleable iron castings, and preserve the sharp corners, the sand blast tumbling barrel is the most effective and efficient method of doing the work. Fig. 1 shows two sand blast tumbling barrels placed back to back, with double hose sand blast machine between and sand separator above. Fig. 2 shows the suction hoppers which go beneath the barrels. These barrels are of extra heavy construction, having steel shell, cast iron heads, with steel hands shrunk on heads to take the wear, and open hearth steel bearing wheels. The barrels are completely covered in with an iron casing, having angle iron corners.

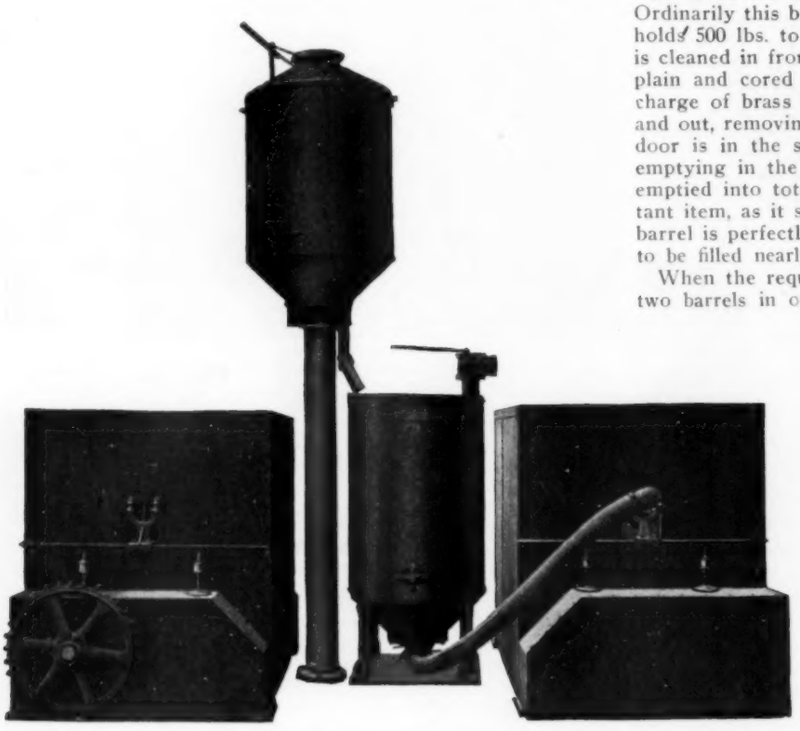


FIG. 1—SAND BLAST TUMBLING BARRELS WITH DOUBLE HOSE SAND BLAST MACHINE, SUCTION ELEVATOR AND SAND SEPARATOR.

The suction hoppers are made extra heavy, to stand the wear of the sand. The double hose sand blast machine is of our standard construction and connects to nozzles at either end of the barrel. The nozzles are easily shifted from one barrel to the other, as required. The sand blast machine is tested to 80 lbs. pressure; 10 to 15 lbs. is ample for brass, and 20 to 30 lbs. for gray iron and malleable iron castings. This machine gives a positive method of introducing the sand blast into the barrel, and on account of ample passages, every pound of pressure goes into velocity, which gives the sand the highest momentum possible with the original air pressure. A special feature on these barrels is an arrangement by which the nozzles are caused to have a small movement up and down, which gives the best distribution of sand in the barrel. By means of the oscillating nozzle the cleaning time is materially lessened over that required when nozzles are held stationary.

It is found that the average requirements are best suited with a 36 in. diameter x 48 ins. inside dimension barrel. Ordinarily this barrel is filled a little over one-third full, and holds 500 lbs. to 600 lbs. of castings. A charge of this size is cleaned in from five to twenty minutes. Time varies with plain and cored work, and different grades of castings. A charge of brass bib cocks can be cleaned thoroughly inside and out, removing all the cores, within twenty minutes. The door is in the shell of the barrel, which allows filling and emptying in the quickest possible time. The barrel can be emptied into tote boxes placed beneath, which is an important item, as it saves a lot of rehandling. The inside of the barrel is perfectly free from all obstructions, which allows it to be filled nearly full on some lines of large and open work.

When the requirements demand, it is customary to put in two barrels in order that one may be cleaning castings while the other is being emptied and refilled. One of the large valve companies, with two of these barrels clean in ten hours over ten tons of brass castings, using 15 lbs. pressure. To prevent the dust getting into machine shop and nearby dwellings, it is generally found necessary to have a dry process dust collector, which consists of a number of cloth screens inside of a steel casing. This collector can be placed in any out-of-the-way location. A dust pipe would be run from the sand separator, shown on halftone No. 1, to the dust collector, and a suction pipe from collector to the fan. This collector is guaranteed to perfectly collect the dust, so that none can escape.

For descriptive matter and information regarding this apparatus address J. W. Paxson Company, Philadelphia, Pa.

FIG. 2—SUCTION HOPPERS.

SAFETY SHACKLE HOOK

One of the interesting exhibits at the American Museum of Safety, No. 29 West 39th street, New York City, is a patented self-closing safety shackle hook for hoisting work. There have been many accidents due to the disengaging of ropes and chains from hooks and shackles, and this device aims to prevent such accidents. As shown in sketch, the device consists of two parts, the hook proper and the guardfinger, which are hinged together at the top by a steel pin. The guardfinger is made in one piece with the eye by which the shackle is attached to the hoisting line. Just below the eye a slot is punched in the guardfinger piece, into which is inserted the flattened upper end of the hook shank. The flattened portion is punched or drilled to receive a pin-bolt which passes through the walls of the slot and thus holds the shank end in place.

NORDEN SAFETY HOOK.

The lower end of the guardfinger and the point of the hook are halved together so that the point is smooth, and when the hook is closed it appears like a solid eye or link. A lug projecting from the end of the guardfinger enters a slot in the point of the hook and serves to transmit some of the load to the finger, thus diminishing the bending stress in the hook proper. The lug is made long enough to extend clear through the hook point, and has a hole drilled near its end in which a cotter pin can be inserted if desired, to securely lock the guardfinger in place. There is also an inward thrust from the end of the guardfinger against the point of the hook, which, together with the locking device greatly strengthens the hook. It is evident that the hook can be easily opened when empty, but when loaded it will close automatically and the guardfinger will be held against the point of the hook. In order to make the finger press against the point of the hook, the center of the hinge pin is placed a little in front of the line of hoisting pull on the hook.

THE NORDEN HOOK—OPEN.

It is claimed that a hook made in this manner, of good material, should be safe, handy and stronger than an ordinary open hook as the stress is transmitted to all parts of the hook, that it is very useful for all kinds of hoisting work where ordinary hooks are not to be relied upon, and particularly where shackles are used and quick changes are required to be made, it saves time consumed in screwing and unscrewing bolts in shackles. In using shackles sometimes the pin is carelessly or incompletely inserted, sometimes resulting in serious accidents. This danger is obviated by the use of a hook of this kind because as long as the weight is on the hook it cannot open, but for still further security a cotter pin can be inserted in the hole formed in the lug (I) if desired. This hook has been endorsed by the leading casualty companies and the American Museum of Safety, after a thorough investigation. It is the invention of F. F. Norden, of New York, and is being introduced by E. W. Marvin, 115 Broadway, New York.

FIREPROOF LACQUERS

The Chemical Products Company, manufacturing chemists, 93 Broad street, Boston, Mass., have put on the market a new line of high grade lacquers, called Celestron Non-inflammable Lacquers, the use of which they state, eliminates all danger from fire or explosions.

Most lacquers, as is well known, are made from ordinary soluble cotton which is cellulose nitrate, the base of celluloids, smokeless powders and gun cotton. The nitric acid in its composition makes it extremely inflammable and unstable The soluble cotton used as a base for Celestron lacquers is not cellulose nitrate but cellulose acetate, and the difference between the acetic acid and the nitric acid combined with the cotton makes the immense difference in the inflammability of the product. Whereas ordinary dry soluble cotton, when ignited will flash and burn in the smallest fraction of a second, Celestron cotton when ignited melts and extinguishes itself, and it is necessary to keep a flame in contact with it to make it continue to burn.

The solvents used to dissolve the cellulose acetate, or as it is called, Celestron cotton, are entirely different from those used in ordinary soluble cotton. The best solvents for it are new liquids which on account of their chemical composition are absolutely non-inflammable. Thus by a peculiar condition of circumstances Celestron hard-to-burn soluble cotton dissolves in solvents which are not inflammable, making a lacquer the vapors and liquid of which are absolutely non-inflammable, and the residues which result from drips are absolutely safe. The manufacturers call attention to the fact that in case of emergency Celestron lacquer could be used as a very efficient, though possibly an expensive fire extinguisher.

POLISHING LEATHERS

The Peckham Manufacturing Company, Newark, N. J., have sent out a circular regarding their leather polishing meal and cut leathers for polishing metal articles. It is claimed by this company that this meal surpasses in efficiency all the old-time scrap polishing materials. It will produce more, better and quicker results than have ever before been approached. It is very soft, light and bulky; is equally effective on light or heavy work, and does not roll or mat into balls or cakes. The meal is used in the tumbling barrel as any other material, and as it is very light it will not make the same weight for its bulk as scrap leather, sawdust, etc. A few experiments will demonstrate the proper quantity for any class of work.

The company claim that the meal never wears out, but can be used over and over again, thus effecting a big saving in the cost of polishing metal. The polishing meal is packed in compressed bales, weighing about 400 pounds and is shipped from Newark at a price of four cents per pound for the meal and three cents per pound for cut leather, with a special price for ton lots.

Anyone interested in these products is invited to send for circular entitled "Leather Meal."

PROCESS FOR GOLD BACKING MIRRORS

The Cowper-Coles process or backing gold mirrors, it is stated, has proved very successful, and is extensively employed, since the advantages over the ordinary silver method are so great. Not only is the gold unaffected by conditions which set up deterioration in silvered mirrors, but the light reflected is more penetrating and entirely non-dazzling. Gold backed mirrors are thus eminently adapted for use in motorcar headlights.

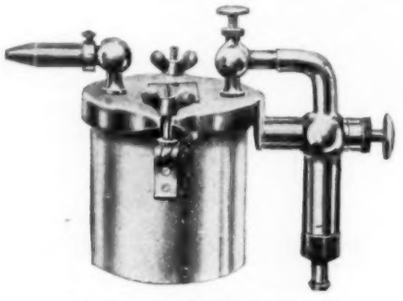
This invention has also been adapted to general house lighting, decoration and other purposes. One of the drawbacks of the metallic filament electric incandescent light is its powerful glare, which is so trying to the eyes. This drawback can be entirely overcome with very little sacrifice of illumination, if a thin film of gold is deposited on the lower half of the lamp bulb, though a more satisfactory effect is secured if a glass reflector is suspended immediately beneath the lamp. The reflector throws the greater part of the light back on to the ceiling where it becomes diffused, but a certain quantity of the light passes through the reflector. This, being of a pleasing green tint and mingling with the diffused illumination, produces a soft light, which is very restful to the eyes. This process is the invention of Sherard Cowper-Coles, and is controlled by the Cowper-Coles Engineering Company, Ltd., electro-chemists and chemical engineers, Westminster, London.

NEW ECLIPSE PRODUCTS

NEW POWDER SPRAYER.

The Eclipse Air Brake and Compressor Company, 20 Nelson street, Bloomfield, N. J., have recently put upon the market the apparatus for the finishing of metals described below:

The machine shown in cut has just been perfected for applying dry bronze powder with compressed air. The powder can be blown either in a fine line or in a wide spray to cover surfaces of tubing. A few machines have been placed with bedstead factories and have been very successful in covering tubing and surfaces and also in fine line work for the imitation of oxidizing. The construction of the machine is much the same as that of the regular Air Brush described in THE METAL INDUSTRY for February, 1911, but has certain features altered to make it practical for dry powder use. A small volume of compressed air at a pressure of about 10 pounds is necessary to operate the machine.



ECLIPSE POWDER SPRAYER.

ECLIPSE AIR COMPRESSOR.

This compressor was designed especially to meet the requirements of air brush and sand blast work and for similar purposes. They are made in five regular sizes, designated Nos. 1 to 5, with dimensions as follows:

No.	Capacity in cubic feet.	Revolutions per minute.	Diam. of cylinder in inches.	Stroke in inches.	Air pressure designed for.	H. P. Required.	Weight.
1	4.5	400	2½	4	120	¾	175
2	7.2	200	4	5	100	1½	210
3	11.4	200	5	5	100	2½	330
4	16.3	200	6	5	70	2½	350
5	22.3	200	7	5	55	3	375

Specifications and quotations for larger or smaller sizes, single or duplex, belt or motor driven, are furnished by the makers on request.

The company states that on account of their simplicity, durability and self-oiling features they will stand continuous use ten hours a day year after year. The crank shaft is steel; the main bearings have adjustable boxes lined with the best babbitt; the cylinder is of special grade of close grained iron. They are water cooled, and are horizontal slow speed (except Number 1), and it is claimed will stand much better under continuous usage than the upright high-speed types. For ordinary industrial use, Numbers 2 and 4 are recommended. Unloading devices are provided which take off the load when sufficient capacity is produced, so that there is no loss of power. The Number 1 machine is for one brush only, and is recommended chiefly where the brush is not used continuously.

For use in connection with Eclipse Sprayers (also made by the same company) or other sprayers, complete outfits are provided, each consisting of a compressor, an unloader, an air receiver, a water tank, and base. Where the lowest possible first cost is essential, customers can furnish their own water tanks and use a reducing valve instead of an unloader.

Further information will be supplied to those desiring it by the manufacturers whose address is given above.

NEW VANADIUM ALLOYS

The American Vanadium Company, Pittsburg, Pa., has recently developed two new alloys of vanadium, one with manganese, and the other with aluminum. The first, or mangano-vanadium, contains about 35 per cent. vanadium, with iron, silicon and aluminum each under 5 per cent.; the second contains about 7 per cent. vanadium, with iron and silicon under 2 per cent. The company states that mangano-vanadium is especially applicable for increasing the strength and physical qualities of manganese brass and bronze, and alumino-vanadium has decided qualities in the improvement of white metal alloys where cupro-vanadium was formerly employed, and where a small percentage of aluminum is not prejudicial. In zinc and aluminum die castings it affords increased strength.

The subject of improving the nature of non-ferrous alloys is daily receiving more consideration and these new compounds of vanadium with other metals common to the traditional mixtures will no doubt be received with great favor.

HYDRAULIC DRAW BENCHES

The hydraulic push bench shown in cut is principally used for pushing cups, tubes, cartridge cases and similar metal articles through the dies, the bench itself serving as an arbor and determining the inside diameter of the finished work. The illustration shows the general design, being of a two-rod type, which runs from the die head to the cylinder inside the guides. Specifications for the above bench are: Piston 12-inch diameter; 20-foot stroke; working pressure 1,200 pounds per square inch.

HYDRAULIC DRAW BENCH.

For further information address the manufacturers, R. D. Wood & Co., Philadelphia, Pa.

NEW TRADE MARK

The Philadelphia Roll and Machine Company has just adopted and applied to the United States Patent Office for a registered trade mark as shown in cut. This step has been taken by the company in order to overcome unfair competition and to protect their customers as well as themselves from jobbers and makers offering something "just as good." It is the company's claim that while their castings are more expensive than those made from the ordinary cupola, the product is of a much higher grade. They are justified in their belief in the correctness of this claim by the fact that their patrons have been satisfied that their castings are the cheapest in the long run, and any difference in the first cost has been entirely eliminated.

ITEMS OF INTEREST TO THE INDIVIDUAL.

CHARLES H. PROCTOR.

Charles H. Proctor, the Plating Editor of THE METAL INDUSTRY, has recently severed his connection with the F. H. Lovell Company, of Arlington, N. J. Mr. Proctor was connected with the above company, for the past ten years, and during that period he had charge of the following departments; the casting of white metal goods used for the production of lamp and art metal novelties, the polishing, plating, lacquering, bronzing and general finishing of all metal goods manufactured by the concern, and also the supervision of manufacture of switch plates and assembling departments. Previous to entering the employ of the F. H. Lovell Company Mr. Proctor was connected as foreman plater with the Ansonia Brass and Copper Company, Ansonia, Conn., for fourteen years.

Mr. Proctor's ability as an electroplater and authority on the finishing of metal goods is well known to the readers of THE METAL INDUSTRY, as he has been a contributor to its columns, both as an author and as an expert in the Shop Problems department, for the past nine years.

It was due to Mr. Proctor's remarkable foresight and firm belief in the future development of the electroplating industry that the present National Electro-Platers' Association, of which he is president, was formed. Beginning with a paper read before the American Foundrymens' Association at Philadelphia, 1907, Mr. Proctor started the idea of a platers' association. This idea took root, and the foundrymen, in meeting assembled, authorized Mr. Proctor to formulate the beginning of such a society. When he had looked into the matter and learned the opinion of a number of platers, he decided that it was for the best interests of those connected with the trade to form such a society that would be independent of the foundrymen, and the result of this investigation, after a prodigious amount of agitation, was the forming in April, 1909, of the present National Electro-Platers' Association of the United States and Canada, of which Mr. Proctor is now serving his third term as president. This association is now reaching the point where it is on a firm basis, and Mr. Proctor may be justly proud of its progress, and the opinion of the majority of its members is shown when he is termed, in a recent issue of the Platers' Quarterly, as "probably one of the best informed men in the trade."

It is Mr. Proctor's intention as far as his plans have been formed for the future, to take a well-earned rest of a short period, and then to organize a company for the manufacture of cast metal and stamped brass goods, such company to be located in New York or Newark, N. J., or it may be that if favorable opportunity offers, that Mr. Proctor will enter the employ of some manufacturing company, making the same line of goods as the F. H. Lovell Company, in the capacity of superintendent.

It perhaps is not generally known that Mr. Proctor is the originator of the Dark Bronze finish used upon the marine fixtures of the United States Navy, and which is now adopted as a standard to supersede the dead black lacquer finish which is no longer accepted. Any concern that manufactures navy goods, that is desirous of using this bronze finish should address Mr. Proctor at 370 Argyle place, Arlington, N. J., or care of THE METAL INDUSTRY.

F. L. Wolfe has become chemical engineer for the Ohio Brass Company, Mansfield, Ohio, succeeding C. T. Bragg, who has become connected with Berry Brothers, varnish manufacturers, Detroit, Mich.

Charles F. Brooker, president of the American Brass Company, Ansonia, Conn., recently had the degree of master of arts conferred upon him by Yale University, at their commencement exercises.

T. C. EICHSTAEDT.

T. C. Eichstaedt, the subject of this sketch and the author of numerous articles that have appeared in the columns of THE METAL INDUSTRY, has had, up to the present time, a most interesting career. Born in Germany in 1871, he came to this country with his family in 1872. They settled in New Britain, Conn., where his father died when Mr. Eichstaedt was a boy of twelve, and from that time he had to start out to make his living. His first employment was in the factory of the J. B. Sargeant Company, New Haven, Conn., where he started in the polishing room of the lock department, and got his first knowledge of buffing and polishing. He remained with this company for four years and then began a period of wandering which carried him from one end of the country to the other, and which extended over twenty-five years.

T. C. EICHSTAEDT.

His experience was principally connected with polishing, plating and finishing of metals and the installation of plants that were necessary for the carrying on of such work. Although having no school education he, by reason of hard study utside of working hours, made himself master of the art of nickel, copper and brass plating to such an extent that in one case he held a position as foreman plater for eight years.

Not the least interesting feature of Mr. Eichstaedt's life was the fact that in 1910 he became mechanician to Ralph Johnston, the aviator who met his death at Overland Park, Denver, Col., last November. Mr. Eichstaedt then became mechanician for Philip Parmelee. At the close of the season he took charge of the Plating Department of the Cadillac Motor Company, of Detroit, Mich., where he is at the present time.

P. G. Smith, secretary of the J. D. Smith Foundry Supply Company, foundry engineers and manufacturers, Cleveland, Ohio, has taken charge of the firm's Eastern offices, 378 Ellicott Square Building, Buffalo, N. Y., from which point all the Eastern and Canadian trade business will be handled.

Joseph A. Phillips, who was for a number of years connected with the Alma Manufacturing Company, Baltimore, Md., in the snap fastener department, has accepted a position as foreman of the tool-making department with the New York Button Works, New York.

R. F. Lang, 31 Broadway, New York, importer of metals, including "Royal" Manganese Copper, which is used very extensively in the manufacture of high-grade manganese bronze, sailed for Europe on July 22, to be gone about six weeks. During his absence the office and staff will be in charge of A. H. Dessow, who will give all inquiries prompt attention.

R. S. Rushton, manager of the Socieded Anonima, Fundicion y Talleres "La Union," brass founders, Buenos Aires, Argentina, has for the past six weeks been inspecting the large brass foundries of this country with a view of installing up-to-date American machinery and foundry practice in the Argentine works.

Associations and Societies

DIRECTORY OF AND REPORTS OF THE PROCEEDINGS OF THE METAL TRADES ORGANIZATIONS.

ELECTRO-PLATERS' ASSOCIATION

President, Charles H. Proctor, Arlington, N. J.; Treasurer, H. H. Reama, New York, N. Y.; Corresponding and Financial Secretary, Royal F. Clark; Recording Secretary, Edward Faint. All correspondence should be addressed to the Corresponding Secretary, Royal F. Clark, 246 Fulton avenue, Jersey City, N. J. This is an educational society, the objects of which are to promote the dissemination of knowledge concerning the art of electro-deposition of metals in all its branches. Meets at Grand Opera House Building, 309 W. 23d St., on the fourth Friday of each month, 8 p. m.

The thirtieth regular meeting of this association was held on Friday, July 28, with twenty-three members present. In the absence of the president, William J. Schneider, first vice-president, occupied the chair. The financial secretary read his quarterly report, showing the association to be in a very good condition financially.

G. E. Moreland, of Pittsburg, Pa., gave a very clear description of the process of sherardizing, and William J. Schneider read a paper on Rust-Proof Black, describing the method he used some years ago to produce a good black on iron and steel by the phosphoric acid process. His explanation was very clear and his paper was given undivided attention by all present. J. A. Stremel presented a model switchboard for regulating and measuring currents of electricity which had been arranged specially for use in electroplating, and by its use the current could be reduced to the lowest possible minimum or raised to the full extent of the capacity of the generator simply by throwing switches in or out. All agreed that the arrangement of the switch board was unique and practicable. Samples of electro-precipitation on the metal aluminum were exhibited by G. B. Hogaboom and they looked as well as could be done on copper or other metals.

Several papers are expected at the next meeting, among which are one by J. A. Stremel on The Stripping of Metals, and a third lecture on Chemistry by G. B. Hogaboom.

The regular monthly meeting of the Philadelphia branch was held at Dooner's Hotel, Friday, July 28. Joseph Dinan spoke on Electro-Tinning. Julius Neu will speak on bright nickeling at the August meeting.

AMERICAN SOCIETY FOR TESTING MATERIALS

President, Henry M. Howe, New York; secretary-treasurer, Edgar Marburg, University of Pennsylvania, Philadelphia, Pa., to whom all correspondence should be addressed. The society is affiliated with the International Association for Testing Materials and is a corporation formed for the promotion of Knowledge of the Materials of Engineering and the Standardization of Specifications and the Methods of Testing. Meets annually, the time and place being fixed by the Executive Committee.

The American Society for Testing Materials, which is allied with the International Association for Testing Materials, announces that they have a membership of 465 out of a total of 2,598, as compiled for the meeting of the council, held in Munich, Germany, March 18. In numerical strength Germany follows with 399, and Russia, Austria, France, Denmark and Great Britain follow in the order named.

The following papers are announced for the congress to be held in Washington and New York, September, 1912: "Methods of Testing Cast Iron," by Dr. Richard Moldenke; "Hardness Tests," by Dr. Bradley Stoughton; and one on fireproof structures, by Ira H. Woolson.

Correspondence

BUSINESS REPORTS OF THE METAL INDUSTRY CORRESPONDENTS IN THE DIFFERENT INDUSTRIAL CENTERS OF THE WORLD.

WATERBURY, CONN.

AUGUST, 7, 1911.

After six slow and doubtful months in the brass and kindred metal industries of the Naugatuck Valley August 1 finds the outlook for the balance of this year cheerful and promising. It is not such yet that great records are anticipated, but it will surprise none who are close to the situation if orders become so insistent that full time will be enforced in all factories hereabouts.

As related in THE METAL INDUSTRY early last spring, the full tide of foreign business started to return late last winter, and it has not ceased since but flows in with ever increasing volume and so continuously that the large stocks on hand in the departments that prepare the raw material have been exhausted, and the summer gangs of molders in brass foundries are working hard and long to keep the other departments supplied.

With the prospect of having to maintain a full six-day payroll for five and a half days' work during the summer the manufacturers here found it unnecessary to run more than five full days with but slight additions of overtime occasionally, and will probably maintain that schedule to the end of August if orders will permit. Scovill's shop has had to run with day and night gangs in its mills, while the Benedict and Burnham mills, of larger capacity, managed to get along with but a day shift as a rule, but in all departments an average of about 70 per cent. of full forces has been kept busy all summer on the five-day basis. The Randolph-Clowes Company is now showing largely increased activity, and in the plants of the Plume and Atwood Company, the American Ring Company, Chase Rolling Mills Company, Waterbury Manufacturing Company, Blake and Johnson Company, Waterbury Brass Goods Company, New England Watch Company, Rowbottom Machine Company, Henderson Brothers, Berberker and Rowland, Mattatuck Manufacturing Company, Steele and Johnson Company of Waterbury, Coe Brass Company of Torrington and Ansonia, Waterbury Farrel Foundry and Machine Company and the Ansonia Company of the same name, American Pin Company, Oakville Company and Baird Machine Company, there is plenty of activity for this season. The healthy tone of business and bustle in the Waterbury Clock Company is most reassuring, and in the Seth Thomas Company's plant, in Thomaston, there has been plenty of work until the present two weeks vacation began.

Two important changes have occurred recently, although not of great moment. George Rowbottom, of the Rowbottom Machine Company, one of the thriving smaller concerns, has secured controlling interest in the Manville Company, and the retirement

of W. W. Manville and Tracy Manville, his son, occurred in June. Mr. Manville, the elder, will not engage in business any more, and Tracy Manville is considering some exceptionally good offers from outside. That he will probably remain in Connecticut is the belief of his friends. The passing of the Bannatyne Watch Company into temporary receivership caused mild surprise. With such backers Mr. Bannatyne seemed assured of success, but was apparently handicapped in competition by small forces and plant. While other concerns were scrapping, watches returned for repairs, his house was kept busy making good on these goods and, of course, fell behind occasionally, benefitting competitors thereby. That the product was beginning to be widely known is conceded generally, and with wider working facilities greater success should have resulted.

For fall the outlook is rosy, and every mill hereabouts will probably be pushed to attend to orders, foreign and domestic filled. Collections show a reassuring condition financially in nearly all sections.—F. B. F.

PROVIDENCE, R. I.

AUGUST 7, 1911.

Between the excessively hot weather and the vacation shut downs the month of July has not been so active as the preceding ones, but there has been considerable of interest to sustain any flagging tendencies there might otherwise have been. All reports from all parts of the country seem to indicate, however, that business in the metal trades is to be better than ever before. This is especially true in the manufacturing jewelry and silversmithing lines.

Another matter that is causing much consideration among the manufacturing jewelers, and incidentally all metal concerns excepting those identified with iron, is the work that is being accomplished by the agents of the Jewelers' Protective Bureau. Up to a couple of years ago the loss by the metal concerns of gold, silver, plate, brass and copper scraps, stolen by dishonest employees was a considerable item. But with the passage of the laws in this State concerning the giving of false names when pawning goods of any kind and the forbidding of pawnbrokers or refiners or others purchasing scrap metal without positive knowledge of its origin and ownership has done much to check the dishonest energies of employees. However, there is much of this business carried on and the Jewelers' Protective Bureau, which was largely instrumental in securing the passage of the two laws referred to, employs a trained detective all the time to ferret out these cases.

The new factory building of the Waite-Thresher Company, corner of Chestnut and Pine streets and Abbott Park place, is now occupied, the several tenants moving in the past month. Among those in the building are Waite-Thresher Company, R. L. Griffiths & Sons Company, Wolstenholme Manufacturing Company, who removed from other shops in this city, and Robinson Bros., who were recently burned out at the fire at Plainville, Mass.

Francis McKenna, proprietor of the City Brass Foundry, of Pawtucket, died July 29 at his home, 361 High street, Central Falls. He had been in failing health for several weeks, being afflicted with kidney troubles, and his death was not unexpected by the members of his family. He was was born in County Monaghan, Ireland, in 1857, and came to this country in 1873, settling in Central Falls. He learned the trade of brass founder at which he worked until 1890, when he established his own foundry and the business prospered from the beginning. He is survived by a widow and three sons and four daughters.—W. H. M.

ATTLEBORO, MASS.

August 7, 1911.

The trade has become interested in the campaign of Col. Sidney O. Bigney, who declares that false marking of jewelry must stop and that the law must be observed. By meaning of advertisements in the trade papers, he served notice to the trade that violations would not be allowed to pass unnoticed after August 1.

His first letter to the trade said: "I want your support in stamping out one of the most detestable evils which exists today in the jewelry industry, namely, the false stamping of goods by unscrupulous manufacturers, or in other words, pirating the truth for the sole purpose of personal gain, which not only deceives, but robs the innocent person.

"These men properly come under the Rooseveltian ban of 'undesirable citizens.' State and federal laws and sufficient to protect dealers from such methods. This is just the beginning of a campaign which will be an eye-opener to many dealers who believe they have been buying one-tenth gold chain. Fair-minded manufacturers do not object to honest competition. These men are going to quit this robber's scheme and it will be the business of the federal authorities to look after them.

"Anyone who has knowingly violated the law which went into effect on June 13, 1907, forbidding the false stamping of gold, silver or plated goods, is a self-convicted criminal."

George H. Holmes, of Providence, president of the New England Jewelers' & Silversmiths' Association, declared when asked concerning the Bigney campaign that the object was a worthy one, but that it should be attained through the medium of the association or like association. He implied that Col Bigney was seeking to advertise himself. In response, the Attleboro jeweler announced that if Mr. Holmes would publicly agree to take up the question and convince the public that the organization would carry on the reform fearlessly, he would have nothing more to say on the subject. The Bigney ads for the last week in July carried no reference to the campaign, and the trade awaited the outcome with growing interest.

John J. Coady, a local attorney, is the head of a company being organized to manufacture cut glass ware. He states that the company has secured a device, which not only reduces the breakages to a minimum, but also cuts the time for cutting by nearly a half. A factory is to be started either in Attleboro or New Bedford.

The W. H. Saart Company has purchased the Forest Street factory, which it has been occupying under a lease, and will enlarge several departments to meet a growing trade. In seven years the weekly payroll of the concern has grown from $63 to $2,500.

The decision of the Adams and allied express companies to charge one rate based on the through distance when packages are handled by more than one company, means a big yearly saving to the jewelers whose express bills are large. Heretofore each express company charged its own rates for the distance it took the packages and the new system will materially reduce the charge.

The Plainville Land Company has not as yet decided on its plans to rebuild on the site of the factory which was burned down. It is expected that a concrete building, much larger than the century-old wooden building which was destroyed, will be erected and that the town will experience a business boom in consequence. Two of the burned out firms have removed to Providence and one has taken temporary quarters in North Attleboro.

A score of Attleboro and North Attleboro jewelers have decided to prepare a jewelry exhibit for the Boston Chember of Commerce Exposition this fall. An endeavor is being made to interest Providence firms also.—A. L. M.

PHILADELPHIA, PA.

AUGUST 7, 1911.

All trades are living in hopes that the fall will develop some extra business and that all the factories will be busier than they have been for some time. The last three years has been a rather quiet one for a great many concerns, and there seems to be no need for it. There is just as much money in the country, the crops last year were the largest on record and the exports for the fiscal year just passed are the largest in the history of the country, yet business is not good. There are few factories that have been working this year or last year above 75 per cent. of their capacity, except for a few weeks now and then, and many have not shown any more than 50 to 60 per cent. of their real capacity. The steel trade only shows a working output of 65 per cent. Collections have not been any too good, and the retailers and jobbers have not bought the usual amounts. They are holding off and the big buyers are still more cautious.

Philadelphia is one of the greatest manufacturing places in the country and a most varied line of articles are made here.

There has been considerable in the way of new factory buildings put up here this year and additions and enlargements made. This, of course, necessitates the ordering of more machinery

and supplies. The factories under way here now will cost a total of $5,000,000.

Philadelphia has a very large foundry, brass and bronze trade as well as in jewelry and silver goods. The latter lines are growing considerably and their goods are sold through New Jersey, Pennsylvania, West Virginia, Ohio and many other States. This city is becoming more noted every year as a jobbing center, and these lines show expansion with more or less regularity.

The S. S. Wenzell Company are erecting a $30,000 foundry at Fiftieth street and Parkside avenue.

The Abrasive Material Company are building a group of buildings to cost $100,000 at James and Fraley streets.

The American Can Company have broken ground at Beach and Palmer streets for a $200,000 plant, on the site of the old Neafie and Levy Companies' foundry.

The Keystone Watch Company's factory here at Nineteenth and Brown streets, has been closed up by order of Charles M. Fogg, treasurer and general manager, and all their orders will be filled from the factory of the Crescent Watch Case Company, of Newark, N. J., which plant is controlled by the same firm. They also operate the Philadelphia Watch Case Company at Riverside, N. J. There has been a strike on for some time at the Keystone plant here, and it is thought that was one of the reasons for the change.

Dieges and Clust, of 1123 Chestnut street, are making a specialty of manufacturing medals, badges, souvenirs and cups. —H. S.

DETROIT, MICH.

AUGUST 7, 1911.

No material change in the brass industry has taken place during the last four weeks. Factories are running moderately, and none are reported to have an undue surplus of orders. The demand for plumbing supplies is extremely quiet, although this is the midst of the building season. Building conditions in Detroit, however, are unusually good, and if other sections of the country were as brisk as this city, there would be another story to tell regarding this branch of the brass industry. The factories, however, are running with their usual force and there seems to be few men idle. Detroit probably produces more brass trolley wheels than any other city in the country. A large business has been built up, and the product is being sent to all parts of the country. This line of brass industry is doing unusually well; in fact, it has been brisk for over a year. It does not require a great amount of machinery to make these wheels, and as a result the profits are good. Detroit will soon have a monopoly on this industry, the same as it is getting on several other branches of brass manufacture.

It is hardly necessary to take up the branch of brass industry pertaining to the manufacture of automobiles. The greatest number of automobile factories in Detroit maintain their own brass plants. There are probably no finer establishments of the kind than those owned by the Cadillac, the Ford and the Packard companies. The Chalmers and several other concerns also have fine brass-working plants. Strange as it may seem, but it is true, nevertheless, that nearly all these automobile factories are unable to manufacture enough brass parts to meet their own demand and are constantly relying on outside brass factories for their supplies. This is due entirely to the fact that every automobile factory in the city is working to its fullest capacity. How long this will keep up is hard to tell, but judging from the past there will be a let-up late in the fall. Then business there will be slow until after the annual automobile shows and the spring campaign begins. It is not believed by automobile manufacturers that next season will be as backward as last, when business did not pick up until well along in March and April. Manufacturing jewelers are planning for their fall and winter work and anticipate an increased business later in the season. As it is now, things are rather quiet.—F. J. H.

TRADE NEWS

TRADE NEWS OF INTEREST DESIRED FROM ALL OF OUR READERS. ADDRESS THE METAL INDUSTRY, 99 JOHN STREET, NEW YORK

ADDITIONAL TRADE NEWS WILL BE FOUND UNDER "CORRESPONDENCE."

The Tudhope Motor Company, Orillia, Ont., are installing a plating plant.

The Fidelity Metal Company, 28 Dobbin street, Brooklyn, N. Y., would like to receive estimates on the erection of a one-ton capacity soft metal dross furnace.

The report that the Thatcher Furnace Company, manufacturers of steam and hot water heaters, furnaces and ranges, New York, were installing a brass foundry, is reported as unfounded by Edward Benedict, treasurer of the company.

The Davison Chemical Company, Baltimore, Maryland, have recently purchased a tract of land of about 200 acres adjoining their present plant, but are not contemplating, at present, any increase in plant construction.

Arthur S. Rushton, Woonsocket, R. I., announces the completion of his new jobbing foundry for turning out small brass, bronze and aluminum castings, particularly pattern castings. This is the only jobbing brass foundry in Woonsocket.

The North Bay Iron Wire & General Metal Works, North Bay, Ontario, has succeeded to the business of the Nipissing Foundry & Machine Company. The new company will engage in the manufacture of iron, brass and aluminum castings, also wirework, fences, gates, etc.

The Selby Smelting & Lead Company, manufacturers of solder, babbitt and type metals, shot, etc., San Francisco, Cal., announce through Wm. B. Stadtfeld, manager of sales department, that they have moved into their new and up-to-date factory, at First and Howard streets.

The New Britain Machine Company, manufacturers of turret machines, New Britain, Conn., announce that they have purchased the plant, patents and good will of George G. Prentice & Company, Inc., manufacturers of multiple spindle automatic turret machines of New Haven, Conn.

The business of the U. S. Electro-Chemical Company, 78 Lafayette street, New York, is being closed out on account of the death of H. Hirshbach, the proprietor. The good will, formulas, stock, etc., is being sold. This concern made a specialty of electro-plating salts and small electro-plating outfits.

The Dutchess Foundry Company, Poughkeepsie, N. Y., composed of L. J. Van Zile and William Wagnitz, is negotiating with the owners of the Milton foundry for the purchase of that plant. It is the intention of the Dutchess company to operate the Milton plant in addition to their own, and fifteen brass molders will be put to work.

An American consular officer in Germany reports that a firm in his district wants quantities of drawn aluminum wires or ribbon 0.8 by 1.6 millimeters 0.0315 by 0.0628 inches), in lengths of about 200 meters (656 feet). When writing the Bureau of Manufacturers, Washington, D. C., for the address, refer to file No. 6925.

A. P. Munning and W. L. Loeb announce the establishment of a new company to be known as the Munning-Loeb Company,

main offices and works, Matawan, N. J., to be devoted to the manufacture of electroplating and buffing equipment and supplies, such as anodes, brushes, buffs, chemicals, dynamos, lathes, nickel salts, rouges, tanks, wheels, etc., of the highest grade only.

An American consular officer in Italy reports that a business man in his district desires to represent as agent in that country American manufacturers of sheet zinc, copper and brass. The inquirer states that a considerable demand exists for this material and that he is in a position to handle it to the best advantage. Desirable references can be furnished. Correspondence in English, French, or Italian. Address on file at Bureau of Manufacturers, Washington, D. C.

The published report of the establishment of a Canadian branch factory at Port Arthur, Ontario, by the H. Mueller Manufacturing Company, manufacturers of water, plumbing and gas brass goods, Decatur, Illinois, is denied by Adolph Mueller, president of the company. He states that there has not been any decision by his company in reference to the establishment of a Canadian factory, although it is admitted that the question of locating a branch factory in Canada is now under consideration.

The Riverside Metal Refining Company, manufacturers of ingot brass and babbitt metals, Connellsville, Pa., have recently introduced a new babbitt, known as "Silver Bar," intended especially for tin plate and other rolling mill bearings. The company have recently appointed the following sales representatives: H. P. Weller Company, Erie, Pa.; Humbird Supply Company, Cumberland, Md.; Erie Mill & Marine Supply Company, Buffalo, N. Y.; Niagara Machine Company, Niagara Falls, N. Y., and the Union Electric Company, Pittsburg, Pa.

McLaughlin & Co., manufacturers of platers' and polishers' supplies, Buffalo, N. Y., announce that they have taken over the business of the Kortum Manufacturing Company, and are doing business at the old stand. M. F. Legge has been appointed general manager, and states that they are carrying a full line of plating and polishing supplies, and are also manufacturing buffs, composition lime, and compositions of all kinds, and will be glad to receive such inquiries from the trade as their wants demand.

The New York Metalizing Company announces that they have equipped a metal plant and are now operating for the manufacture of metalized goods. This company has highly perfected the art of metalizing with copper, bronze, brass and silver any non-conductive substances, such as plaster, terra cotta, wood, lace, etc. They are now prepared to design, model, cast and metalize any desired fixture, chandelier, statue or sign, and all orders will be promptly executed. Their address is corner of Pearl and Prospect streets, Brooklyn.

The Wheeling Mold & Foundry Company, manufacturers of rolling mill machinery, ingot molds, etc., Wheeling, W. Va., report that they have secured a large proportion of the contracts for furnishing iron, steel and bronze castings for the Panama Canal, and some heavy shipments to the canal zone have already been made during recent months. The company now has Government contracts on its books amounting in round figures to $1,500,000, which includes a sub-contract with the McClintic-Marshall Construction Company of Pittsburg.

Proposals will be received at the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until 10 o'clock a. m., August 22, 1911, and publicly opened immediately thereafter, to furnish at the navy yard, Mare Island, Cal., a quantity of naval supplies, as follows: Sch. 3791: White zinc.—Sch. 3796: Composition pipe fittings, valves.—Sch. 3797: Rod and sheet brass, manganese bronze. Applications for proposals should designate the schedules desired by number. Blank proposals will be furnished upon application to the navy pay office, San Francisco, Cal., or to the Bureau. T. J. Cowie, paymaster-general, U. S. N.

The Cox Brass Manufacturing Company, manufacturers of wind shields and brass fittings for automobiles, Albany, N. Y., have increased their capital stock from $25,000 to $200,000, in order to enlarge their factory in Albany, to take over a factory located in the Middle West, and to establish a branch plant at Detroit, Mich. The Cox Company was founded in 1872, and in 1910 absorbed the Albany Plating Company, which enabled them to turn out finished parts complete from castings to finished products. $75,000 of the capital stock of the company is being offered to the public at the par value of $100.

The Southern Brass Manufacturing and Plating Company, Houston, Tex., who have the most complete plating plant in the South, have recently doubled their capital stock with a view to making extensive improvements. A thoroughly up-to-date brass foundry, equipped with all modern appointments, will be installed, and they will import directly the highest grade of French sand for the molding of the finest grades of bronze and brass for architectural work. The company reports, through Thomas C. White, vice-president and general manager, that their electro-galvanizing plant, the installation of which has just been completed, is one of the most thoroughly equipped of the kind in the entire South.

The Geneva Buff and Polishing Company, who recently succeeded the Auburn Soap and Chemical Company, Auburn, N. Y., have filed certificate of incorporation with the secretary of state. The new Geneva industry will have a capital stock of $15,000, and its incorporators are A. J. Brinkerhoff, of Auburn, William S. Silsby and L. G. Hoskins, of Geneva. The company is now in operation, and are producing all kinds of buffing wheels, buffing supplies and other materials used in connection with the polishing of metals. These products are sold to manufacturing companies that have polishing departments in connection with their plants. These industries include stove works, bicycle, automobile and typewriter factories, and, in fact, all classes of metal working concerns.

The Bath Iron Works, Bath, Me., are building a new brass foundry 90 by 60 feet, with a daily capacity of five tons. The foundry will be of the latest approved style, all four walls to be of steel and glass, giving ample light, and will be equipped with up-to-date machinery, having several oil furnaces of the pit kind, riddles, vibrators, electric traveling crane, sprue cutters, band saws—in fact, everything that is modern, making the foundry one of the best in the country.

This foundry turns out a high class of work, most of it coming under rigid government inspection. The castings vary from the smallest up to 3,000 pounds, and have to undergo chemical, physical and hydraulic tests. Everyone knows the quality of the ships built here, and the castings are as nearly perfect as man can get them, thus doing their part to add to the reputation of this concern made famous by General Thomas W. Hyde.

A VALUABLE TREATISE ON CORROSION OF IRON AND STEEL.

Anent the present widespread discussion of corrosion of steel and iron we note the timely issue of a very comprehensive treatise on the subject by the makers of Toncan metal. The treatise sets forth, clearly and concisely, the facts concerning corrosion and rust, how and why they differ, their causes and what should be done to overcome them. Some interesting comparisons are made of old time iron and modern iron and steel, which comparisons make clear the fact that the degree of purity, homogeneity and density largely governs the life of iron and steel. The results of many comparative tests are shown by tables and illustrations, and these results will undoubtedly be of great value and interest to sheet metal workers everywhere.

The general tone of the treatise is in line with the ideas of such eminent metallurgists as Cushman, Walker and Sang. No attempt is made to delve deeply into chemistry nor the fine points of metallurgy. The simplicity of the English is a prominent feature particularly when one considers the technical nature of the subject matter. The many uses to which a rust-resisting product like Toncan metal is adaptable are described and illustrated. The illustrations throughout are fine half-tone reproductions of photographs; the printing is in two colors, and the buff cover embossed in

French vermillion, altogether as attractive a piece of printing as one would care to see. The Stark Rolling Mill Company, of Canton, Ohio, makers of Toncan metal, intend them for the sheet metal trade, but any person interested in the subject can obtain a copy by writing to the Canton offices.

INCREASE OF CAPITAL STOCK

The Bay View Foundry Company, Sandusky, Ohio, have increased their capital stock from $40,000 to $75,000, in order to increase their facilities.

REMOVALS

The Uranimite Company, manufacturers of "uranimite," an assimilator and scavenger of all metals, Buffalo, N. Y., have moved from No. 75, Erie County Bank Building, to 69 Main street.

The Lawlor Molding Machine Company, manufacturers of Lawlor jarring and squeezing machines, Pittsburg, Pa., have moved their offices from the Century Building to the headquarters of the Union Foundry & Machine Company, on West Carson street.

INCORPORATIONS

Business organizations incorporated recently. In addressing them it is advisable to include also the names of the incorporators and their residence. Particulars of additional incorporations may frequently be found in the "Correspondence" columns.

Erie Contracting Company, Buffalo, N. Y. Capital stock, $30,000. To manufacture and deal in copper, tin, iron, etc. Incorporators: F. J. Treisse, E. C. Schienker, J. C. King, all of Buffalo.

McGloughlin Iron and Brass Foundry Company, Laconia, N. H. Capital, $30,000. James McGloughlin, superintendent and manager.

Penn Art Metal Company, Philadelphia, Pa. Capital stock, $200,000. Incorporators: D. W. Pritchard, Philadelphia; G. J. Schmidt, F. J. Schmidt, New York.

Dodge Plating Works, Boston Mass. Capital stock, $25,000. Incorporators: Harry P. Dodge, William W. Dodge and Charles W. McCarthy, all of Boston.

Fidelity Brass Manufacturing Company, Chicago. Capital stock, $25,000. To manufacture metal goods. Incorporators: C. Wells, R. M. Wells, A. T. Carton, all of Chicago.

Shoemaker Manufacturing Company, Trenton, N. J. Capital stock, $125,000. To manufacture metal goods, novelties, etc. Incorporators, W. E. Rue, I. M. Green and M. E. Green, all of Trenton.

Buffalo Aluminum & Bronze Company, Buffalo, N. Y. Capital, $25,000. To carry on a general foundry business. Incorporators: G. W. Morris, J. G. Papell and E. G. Northrop, all of Buffalo.

Cleveland Aluminum Casting Company, Cleveland, Ohio. Capital, $10,000. Incorporators: F. F. Klingman, M. J. Hancox, R. S. Hoffman, A. A. Winkel and J. F. Prosser, all of Cleveland.

American Clock Company, Brooklyn, N. Y. Capital stock, $50,000. To manufacture and deal in clocks and jewelry. Incorporators: Charles Gillman, Hugo Gillman and Edward Riegel, all of Brooklyn.

Acme Specialty Manufacturing Company, Toledo, Ohio. Capital stock, $25,000. To manufacture metal specialties. Incorporators: A. Schlett, C. J. Schneider, Karl A. Flickinger and others, all of Toledo.

Toms River Mineral Company, Camden, N. J. Capital stock, $25,000. Tool makers, brass founders, machinists. Incorporators: F. H. Nussbaum, I. M. Chambers, of Merchantville, N. J., and J. L. Yoder, of Toms River.

U. S. Brass Company, Upper Sandusky, Ohio. Capital stock, $25,000. Incorporators: W. P. Rowland, W. A. Gibson, C. A. McBeth, W. V. Smith, A. B. Castanien, Fred Sammet and Harry Frederick, all of Upper Sandusky.

Westfield Foundry & Valve Company, Westfield, Mass. Capital stock, $55,000. To manufacture brass and iron valves. Officers: C. O. Churchill, president and secretary; L. Holst, vice-president, and R. H. White, treasurer, all of Westfield.

Manhattan Dial Manufacturing Company, Brooklyn, N. Y. Capital stock, $100,000. To manufacture dials, signs, letters, metal and enameled goods. Incorporators: George H. Wunschel, Franch C. Vaughan, and Agnes E. Klein, all of Brooklyn.

Superior Metal Products Company, Elyria, Ohio. Capital stock, $15,000. To manufacture metal stampings and do brass and nickel plating and general machine work. Incorporators: H. E. Hall, L. H. Lang, L. J. Zeager, M. C. Powers and U. J. Smith, all of Elyria.

Detroit Foundry and Manufacturing Company, Detroit, Michigan. Capital stock, $50,000. To manufacture brass and aluminum casting for automobiles. Officers: J. T. Rich, president; Dr. D. A. MacLachlan, vice-president; J. Palmer, jr., secretary; G. E. Lawson, treasurer, all of Detroit.

PRINTED MATTER

Exhaust Fans and Blowers.—F. J. Lederer Company, manufacturers of exhaust fans and blowers, Buffalo, N. Y., describe their line of these machines known under the trade name of "Peer" in a small folder just issued.

Pressure Blowers.—The Nash Engineering Company, manufacturers of hydro-pneumatic pressure blowers, vacuum pumps, etc., Brooklyn, N. Y., give a complete description of their line of machinery in a twelve-page pamphlet just issued.

Solder and Soldering Fluid.—The metal department of John T. Lewis & Bros. Company, Baltimore, Md., has issued several folders giving descriptions and prices of their various products, such as tinners' bar solder and excelsior soldering solution.

Dust Collectors.—The Cleveland Blow Pipe and Manufacturing Company, manufacturers of ventilators, tanks, drip, exhaust heads, etc., of Cleveland, Ohio, have considerable to say regarding their special dust collecting system in a little folder just issued.

Babbitt Metal.—The Electric Smelting and Aluminum Company, Lockport, N. Y., has sent out a folder in the interests of their "Esco" babbitt metal, which they believe will do all that their claim for it., i. e., give perfect satisfaction in all places where a genuine babbitt metal is not required.

Fire Brick.—The E. J. Woodison Company, Detroit, Michigan, have issued a folder giving a description of their line of fire brick, among which are included Woodison steel and Strassburg grades, the latter of which is claimed to be especially suitable for furnaces, boilers and annealing ovens.

TRAMRAIL.—An interesting story of the Moyer tramrail in foundry practice by A. W. Moyer is told in Bulletin T, issued by the Rockwell Furnace Company, New York. The booklet is well illustrated by means of photographs, which show the wide application of the Moyer tramrail to foundry use.

METALLURGICAL APPARATUS.—Sauveur and Boylston, metallurgical engineers, Cambridge, Mass., have issued a third edition of their comprehensive catalog of apparatus for metallography. Complete descriptions are given of all apparatus necessary for the microscopic examination of metals. Copies will be mailed upon request.

MILLING MACHINERY.—The Garvin Machine Company, manufacturers of and dealers in milling and screw machines, drill presses, etc., New York, have issued circulars No. 142 and 143, relating to the Garvin Vertical Spindle Machines, and Garvin No. 3 Duplex Milling Machines respectively. Copies of these circulars may be obtained upon request.

PYROMETERS.—The Wilson-Maeulen Company, makers of electric pyrometers, New York, give a complete description of their line of high grade electric pyrometers in a 21-page pamphlet just issued. Among other styles of pyrometers handled by them are the new types of Le Chatelier pyrometers and "Unipivot" galvanometers. Copies of the pamphlet may be obtained on request.

METAL SPINNING LATHES.—P. Pryibil has issued a handsome catalog giving general information regarding his extensive line of metal spinning lathes. These lathes are manufactured in two types—the straight bed and the extension bed or gap type—full information regarding which is given in the catalog. Copies may be obtained by addressing P. Pryibil, 512 West 41st street, New York.

BRISTOL'S RECORDING INSTRUMENTS.—A handsome condensed catalog consisting of 64 pages, bound in red paper, has been issued by the Bristol Company, manufacturers of Bristol's recording instruments, Waterbury, Conn. This catalog is a condensed general catalog of the Bristol instruments for pressure, temperature, electricity, speed, time, etc., and is numbered 160, copies of which may be obtained upon request.

ABRASIVE.—A small folder, issued by Edson G. Case, Niagara Falls, N. Y., describes the Case abrasive disk, which is claimed to be a distinct improvement over the Diamond disk for dental work. This abrasive consists of alundum which is harder than corundum, electrolytically incorporated into the specially prepared steel by a nickel-plating process and the material is declared to be safe-sided, flexible and rapid.

FOOT PRESSES.—An eight-page bulletin has been issued by the Manville Brothers Company, manufacturers of brass working machinery, Waterbury, Conn. The bulletin gives full descriptions and illustrations of the various kinds of foot presses manufactured by this company, such as regular way, pendulum lever, round slide covering, cloth button covering, hammer and eyelet. Copies of the bulletin will be mailed upon request.

METALLIC ALLOYS.—The Empire Metal Company, Syracuse, N. Y., have issued a series of small booklets relating to the numerous metal products manufactured by them. Included in the list of literature are silver metal, a galvanizing flux alloy, solder tin, lead, aluminum, phosphor tin and copper and fusible alloys of all kinds. There is also a very interesting booklet on the subject of bearing efficiency, which gives valuable information regarding babbitt bearing metals.

NAME PLATES.—A comprehensive little catalogue of name plates and stampings has been issued by the Chandler Company, manufacturers of name plates of Springfield, Mass. This catalogue shows a few representative plates, illustrating the different styles of finish. The company can make anything in name plates and furnish light stampings in any metal to one-eighth inch thick, finished or unfinished, plated or unplated, also a great variety of punch press work, shims, special washers, scales for measuring, etc.

RECORDING VOLTMETERS.—The Bristol Company, manufacturers of Bristol's recording instruments, Waterbury, Conn., have issued Bulletin No. 31 descriptive of Bristol's recording voltmeters for direct and alternating current, which are used with switch-board and portable service with 6, 8 and 12-inch charts. The bulletin contains 43 pages, 35 of which are taken up with description and illustration of the various types of voltmeters manufactured by this company, and the balance contains a partial list of users of Bristol's recording voltmeters.

BRASS AND COPPER GOODS.—The Michigan Copper and Brass Company, manufacturers of brass, bronze and copper goods, Detroit, Mich., have issued a standard price list of their products. This book is a departure from the usual style of brass company catalogs, in that it has a marginal index, rendering it very convenient to arrive instantly at the information desired regarding any particular product. The catalog is composed of 42 pages, 5½ by 8 inches in size, and is bound in flexible cardboard cover, and makes a very convenient book to handle. Copies on request.

CATALOGUE EXHIBIT

An exhibition of every kind of catalogue may be seen at THE METAL INDUSTRY office, 99 John street, New York. THE METAL INDUSTRY is prepared to do all of the work necessary for the making of catalogues, pamphlets, circulars and other printed matter. Estimates will be furnished for writing descriptions, making engravings, printing, binding, for the entire job from beginning to end or any part of it.

AD NEWS

The Munning-Loeb Company, Matawan, N. J., announce in this issue the establishment of a new company for the manufacture of a complete line of high-grade polishing and plating supplies.

The Paasche Air Brush Company, New Era Building, Chicago, Ill., describe and illustrate their pneumatic brushes and sprayers for lacquering, bronzing, etc. For further particulars write for catalogue P1.

Kroeschell Bros. Company, 458 West Erie street, Chicago, Ill., devote a half page to describing the advantages to be gained by using Kroeschell-Schwartz gas or oil burning furnaces for the melting of metals.

The Damascus Bronze Company, Pittsburg, Pa., call attention to the fact that they are the originators and largest manufacturers of phosphorized copper. Their line of metals and alloys is known as the "Globe Brand."

The Chemical Products Company, 93 Broad street, Boston, Mass., advertise in this issue their patented "Celestron Lacquer," which they claim to be a non-inflammable, safety, high-grade lacquer. This lacquer can be obtained colorless or in all colors.

INQUIRIES AND OPPORTUNITIES

Under our directory of "Trade Wants" (published each month in the back advertising pages), will be found a number of inquiries and opportunities which, if followed up, are a means of securing business. Our "Trade Want Directory" fills wants of all kinds. See Want Ad. pages.

INFORMATION BUREAU

Any firm intending to buy metals, machinery or supplies, and desiring the names of the various manufacturers and sellers of these products can obtain the desired information by writing to THE METAL INDUSTRY. Commercial questions are answered by return mail. Our Information Bureau is for the purpose of answering questions of all kinds. Address THE METAL INDUSTRY, 99 John street, New York.

METAL MARKET REVIEW

NEW YORK, August 8, 1911.

COPPER.

The leading feature in the New York copper market during the month is the heavy exports, the total so far exported being 34,955 tons, against 23,018 tons for the same month last year, making total exports so far this year 193,029 tons, against 152,242 tons during the same period in 1910, or an increase of 40,787 tons over the exports for the same period last year.

The home demand has not been very active, and has been filled mostly from second hands at a shade under the figures asked by the leading selling agents.

Statistically, the market is in a most excellent position, and the Producer's statement published below shows an actual decrease in the domestic stocks for the month of 19,695,305 pounds. The European statistics for the fortnight show an increase of 90 tons, but compared with a month ago this decrease in the foreign stocks for the month of July is about 4,794,000 pounds.

With a very decided improvement in the iron and steel market and increased operations in the steel mills, combined with the large increase in the consumption of lead and spelter, as shown in the government reports, lately published, it is naturally expected that the demand for copper for the last half of the year will show a decided improvement. The market for some days has been dull and "easy," with Lake quotable at 12¾c., electrolytic 12.60c., and casting brands at 12½c.

The London standard market is entirely speculative and sentimental, but as Europe is such a large buyer of American copper the sentiment over there is more or less interesting to consumers of the red metal over here. For instance, when England the other day was giving Germany a lesson in poker the price of standard fell off, and our prices were from 5 to 10 points lower, but with the "bluff" called, the market quickly reacted, and prices here were steadier.

The London price is about 10s. lower than a month ago, and closed at £56 6s. 3d.

TIN.

The demand for tin during the month has been very good, 4,300 tons. Considering that every trade paper one takes up is forever crying "nothing doing," it is remarkably surprising, after reading some of these reports, that any tin, copper, lead or spelter has been sold at all this month. The cry, or, rather, wail, has been kept up all the year, and yet the *facts* are that we are doing an enormous export business, the largest the country has ever known. We are going to hold these foreign markets and keep on expanding our export trade, just as surely as our home trade is growing steadily day by day, and it is about time that this "nothing doing" rot is stopped.

The tin market is still controlled by the powerful London syndicate, and every time we buy they put the price up if they please. The market has been left to itself this month, and it is probably a good time to get in supplies for the next three months. Tin today in London is around £188, and here, say, 41¾ cents, and it looks as though there might be some interesting doings between now and the middle of September.

The statistics are certainly bullish; the total deliveries during the month have been very heavy, Europe and America total over 7,000 tons, while the supplies from the Straits for the month were 4,500 tons.

The London market, as we stated before, has been left to itself pretty well, and prices today are about £7 less than a month ago.

LEAD.

The Trust price is supposed to be 4½ cents, New York, for 50-ton lots, while the open market is bringing about ⅛ cent higher. How long this state of affairs is going to last the Trust only knows, but they won't say. The demand is good and prices hold steady at 4⅝ cents for carloads, New York, for prompt and August shipment. In St. Louis the market is quotable at 4.45, East St. Louis.

The London market is firm at £13 18s. 9d.

SPELTER.

The demand for spelter is good, and prices are rather firmer at 5.85, New York, carload lots, for prompt and August shipment, against 5.75 to 5.80 a month ago. In St. Louis the market is quotable at 5.65, East St. Louis, for prompt and August shipments.

ALUMINUM.

The market for aluminum has been easier again at 19¾ to 20 cents for ingots, 98-99 per cent. pure, against 20 cents a month ago—small lots 20¼ to 20½ cents.

ANTIMONY.

The antimony market is easier, with the collapse of the much-talked-about foreign syndicate, the foreign price is £2 lower today for Halletts, at 7¾; Chinese and Hungarian at 7⅛ to 7¼ cents.

SILVER.

The silver market has declined about ½ cent per ounce during the month, opening at 52¾ and closing at 52¼—London closing at 24⅛d., against 24 5/10d. a month ago.

QUICKSILVER.

The wholesale New York price has been up to $50 per flask, but today is easier and quotable at $48 wholesale. Small jobbing lots are quoted at $49 to $50 per flask, according to quantity.

PLATINUM.

Market here keeps very steady at around $44.50 for hard and $42.50 for ordinary refined.

SHEET METALS.

Sheet copper is quoted at 16½ cents, base and wire at 13½ to 13¾ base. The brass manufacturers' list price stands at 13⅜ base, but this price can be shaded.

OLD METALS.

The old metal market has been fairly busy with foreign orders, while some consumers are buying very lightly. Prices are a shade easier.—J. J. A.

COPPER PRODUCTION

(Issued by the Copper Producers' Association.)

		August 8, 1911.
Stocks of marketable copper of all kinds on hand at all points in the United States, July 1, 1911.....		157,434,164
Production of marketable copper in the United States from all domestic and foreign sources during July, 1911		112,167,934
		269,602,098
Deliveries:		
For domestic consumption	56,982,582	
For export	74,880,658	
		131,863,240
Stocks of marketable copper of all kinds on hand at all points in the United States, August 1, 1911.		137,738,858
Stocks decreased during the month of July.....		19,695,306

JULY MOVEMENTS IN METALS

COPPER.	Highest.	Lowest.	Average.
Lake	12.75	12.70	12.75
Electrolytic	12.70	12.50	12.65
Casting	12.60	12.35	12.50
TIN	45.00	41.50	43.00
LEAD	4.60	4.50	4.55
SPELTER	5.85	5.75	5.80
ANTIMONY (Hallett's)	8.00	7.75	7.90
SILVER	.53	.51⅞	52.70

WATERBURY AVERAGE

The average price of lake copper per pound as determined monthly at Waterbury, Conn.:

1910—Average for year 13.13½. 1911—January, 12⅞; February, 12¾; March, 12½; April, 12½; May, 12⅜; June, 12⅝; July, 12¾.

Metal Prices, August 8, 1911

NEW METALS.

	Price per lb. Cents.
COPPER—PIG, BAR AND INGOT AND OLD COPPER. Duty Free, Manufactured 2½c. per lb.	
Lake, carload lots	12.75
Electrolytic, carload lots	12.60
Casting, carload lots	12.50
TIN—Duty Free.	
Straits of Malacca, carload lots	41.50
LEAD—Duty Pigs, Bars and Old, 2½c. per lb.; pipe and sheets, 2⅜c. per lb.	
Pig lead, carload lots	4.55
SPELTER—Duty 1⅜c. per lb. Sheets, 1⅝c. per lb.	
Western carload lots	5.80
ALUMINUM—Duty Crude, 7c. per lb. Plates, sheets, bars and rods, 11c. per lb.	
Small lots	28.00
100 lb. lots	25.00
Ton lots	20.00
ANTIMONY—Duty 1½c. per lb.	
Cookson's, cask lots, nominal	8.50
Hallett's cask lots	7.75
Chinese	7.25
Hungarian grade	7.25
NICKEL—Duty Ingot, 6c. per lb. Sheet, strips and wire 35 per cent. ad valorem.	
Shot, Plaquettes, Ingots, Blocks according to quantity	.43 to .60
MANGANESE METAL—Duty 20 per cent.	.90
MAGNESIUM METAL—Duty 3 cents per pound and 25 per cent. ad valorem (100 lb. lots)	1.85
BISMUTH—Duty free	2.10
CADMIUM—Duty free	.85
CHROMIUM METAL—Duty 25 per cent. ad val.	.98
	Price per oz.
GOLD—Duty free	$20.67
SILVER—Duty free	.52¼
PLATINUM.—Duty free	43.00
QUICKSILVER—Duty 7c. per lb. Price per pound	.70

OLD METALS.

Dealers' Buying Prices. Cents per lb.		Dealers' Selling Prices. Cents per lb.
10.75 to 11.00	Heavy Cut Copper	12.00 to 12.25
10.50 to 10.75	Copper Wire	11.50 to 11.75
9.75 to 10.00	Light Copper	10.50 to 10.75
9.25 to 9.50	Heavy Mach. Comp	10.50 to 10.75
7.00 to 7.25	Heavy Brass	8.00 to 8.25
5.50 to 5.75	Light Brass	6.75 to 7.00
7.00 to 7.25	No. 1 Yellow Brass Turnings	7.75 to 8.00
8.00 to 8.25	No. 1 Comp. Turnings	8.75 to 9.00
3.90 to 4.00	Heavy Lead	—— to 4.25
3.75 to 3.90	Zinc Scrap	—— to 4.25
5.00 to 5.50	Scrap Aluminum, turnings	6.00 to 7.50
10.00 to 12.00	Scrap Aluminum, cast, alloyed	11.00 to 13.00
14.00 to 15.00	Scrap Aluminum, sheet (new)	16.00 to 17.50
23.00 to 24.00	No. 1 Pewter	25.00 to 26.00
20.00 to 23.00	Old Nickel	23.00 to 26.00

INGOT METALS.

			Price per lb. Cents.
Silicon Copper, 10% to 20%	according to quantity		28 to 35
Silicon Copper, 30% guaranteed	"	"	38
Phosphor Copper, 5%	"	"	19 to 21
Phosphor Copper, 10% to 15%, guaranteed	"	"	28 to 30
Manganese Copper, 30%	"	"	30 to 35
Phosphor Tin	"	"	34 to 36
Brass Ingot, Yellow	"	"	8½ to 9½
Brass Ingot, Red	"	"	11 to 12½
Bronze Ingot	"	"	10 to 11
Manganese Bronze	"	"	17 to 19
Phosphor Bronze	"	"	13 to 16
Casting Aluminum Alloys	"	"	29 to 35

PHOSPHORUS—Duty 18c. per lb.
According to quantity ..... 30 to 35

PRICES OF SHEET COPPER.

BASE PRICE, 16.50 Cents per Lb. Net.

PRICES MENTIONED BELOW ARE FOR QUANTITIES OF 100 LBS. AND OVER.

SIZE OF SHEETS.		64 oz. and over 50 lb. sheet 30 x 60 and heavier.	32 oz. to 64 oz. 25 to 50 lbs. sheet 30 x 60.	24 oz. to 32 oz. 18¾ to 25 lb. sheet 30 x 60.	16 oz. to 24 oz. 12½ to 18¾ lb. sheet 30 x 60.	14 oz. and 15 oz. 11 to 12½ lb. sheet 30 x 60.	12 oz. and 13 oz. 9½ to 11 lb. sheet 30 x 60.	10 oz. and 11 oz. 7¾ to 9½ lb. sheet 30 x 60.	8 oz. and 9 oz. 6¼ to 7¾ lb. sheet 30 x 60.	Lighter than 8 oz.
		Cents Per Pound Over Base Price for Soft Coppers								
Not wider than 30 ins.	Not longer than 72 inches.	Base	Base	Base	Base	1	2	3	6	9
	Longer than 72 inches. Not longer than 96 inches.	"	"	"	"	1	3	6	9	
	Longer than 96 inches.	"	"	"	"	2	6			
Wider than 30 ins. but not wider than 36 inches.	Not longer than 72 inches.	"	"	"	"	2	4	7	10	
	Longer than 72 inches. Not longer than 96 inches.	"	"	"	"	2	6	9		
	Longer than 96 inches. Not longer than 120 inches.	"	"	"	1	3				
	Longer than 120 inches.	"	"	1	2					
Wider than 36 ins. but not wider than 48 inches.	Not longer than 72 inches.	"	"	1	2	4	7	10		
	Longer than 72 inches. Not longer than 96 inches.	"	"	1	3	5	8			
	Longer than 96 inches. Not longer than 120 inches.	"	"	2	4	8				
	Longer than 120 inches.	"	1	3	6					
Wider than 48 ins. but not wider than 60 inches.	Not longer than 72 inches.	"	Base	1	3	6	11			
	Longer than 72 inches. Not longer than 96 inches.	"	"	2	4	9				
	Longer than 96 inches. Not longer than 120 inches.	"	1	3	6					
	Longer than 120 inches.	1	2	4	8					
Wider than 60 ins. but not wider than 72 ins.	Not longer than 96 inches.	Base	1	3	8					
	Longer than 96 inches. Not longer than 120 inches.	"	2	5	10					
	Longer than 120 inches.	1	3	8						
Wider than 72 ins. but not wider than 108 ins.	Not longer than 96 inches.	1	3	6						
	Longer than 96 inches. Not longer than 120 inches.	2	4	7						
	Longer than 120 inches.	3	5	9						
Wider than 108 ins.	Not longer than 132 inches.	4	6							
	Longer than 132 inches.	5	8							

The longest dimension in any sheet shall be considered at its length.

CIRCLES, SEGMENTS AND PATTERN SHEETS, advance over prices of Sheet Copper required to cut them from ..... 3 cents per pound.

COLD OR HARD ROLLED COPPER, 14 oz. per square foot, and heavier, add ..... 1 " " "

COLD OR HARD ROLLED COPPER, lighter than 14 oz., per square foot, add ..... 2 " " "

POLISHED COPPER, 20 INCHES WIDE and under, advance over price for Cold Rolled Copper of corresponding dimensions and thickness ..... 1 " " sq. ft.

POLISHED COPPER, WIDER THAN 20 INCHES, advance over price for Cold Rolled Copper of corresponding dimensions and thickness ..... 2 " " " "

COLD ROLLED COPPER, PREPARED SUITABLE FOR POLISHING, same as Polished Copper of corresponding dimensions and thickness.

COLD ROLLED AND ANNEALED COPPER SHEETS OR CIRCLES, same price as Cold or Hard Rolled Copper of corresponding dimensions and thickness.

ROUND COPPER ROD, ⅜ inch diameter or over ..... Base Price.

(Rectangular, Square and Irregular Shapes, Copper Rod, Special Prices.)

	Cents per lb.
ZINC—Duty, sheet, 1½c. per lb.	
Carload lots, standard sizes and gauges, at mill	7.50 less 8%
Casks, jobbers' prices	8.00
Open casks, jobbers' prices	8.50

Metal Prices, August 8, 1911

PRICES ON BRASS MATERIAL—MILL SHIPMENTS,

In effect July 1, 1911, and until further notice.

To customers who purchase less than 40,000 lbs. per year and over 5,000 lbs. per year.

	Net base per lb. High Brass.	Low Brass.	Bronze.
Sheet	$0.13⅝	$0.14¾	$0.15⅞
Wire	.13⅝	.14¾	.15⅞
Rod	.13⅝	.15½	.16⅞
Brazed tubing	.18½	—	.20⅝
Open seam tubing	.16½	—	.18⅝
Angles and channels, plain	.16¾	—	.18⅝

50% discount from all extras as shown in American Brass Manufacturers' Price List No. 8.

NET EXTRAS FOR QUALITY.

Sheet—Extra spring drawing and spinning brass	½c.	per lb. net advance
" —Best spring, drawing and spinning brass	1½c.	" " " "
Wire —Extra spring and brazing wire	½c.	" " " "
" —Best spring and brazing wire	1c.	" " " "

To customers who purchase less than 5,000 lbs. per year.

	Net base per lb. High Brass.	Low Brass.	Bronze.
Sheet	$0.14⅝	$0.15¾	$0.16⅞
Wire	.14⅝	.15¾	.16⅞
Rod	.14⅝	.16½	.17⅞
Brazed tubing	.19½	—	.21⅝
Open seam tubing	.17½	—	.19⅝
Angles and channels, plain	.17¾	—	.19⅝

5% discount from all extras as shown in American Brass Manufacturers' Price List No. 8.

NET EXTRAS FOR QUALITY.

Sheet—Extra spring, drawing and spinning brass	½c.	per lb. net advance
" —Best spring, drawing and spinning brass	1½c.	" " " "
Wire —Extra spring and brazing wire	½c.	" " " "
" —Best spring and brazing wire	1c.	" " " "

BARE COPPER WIRE—CARLOAD LOTS.

13.75c. per lb. base.

SOLDERING COPPERS.

300 lbs. and over in one order	17½c. per lb. base
100 lbs. to 300 lbs. in one order	18c. " " "
Less than 100 lbs. in one order	19½c. " " "

PRICES FOR SEAMLESS BRASS TUBING.

From 1¼ to 3½ in O. D. Nos. 4 to 13 Stubs' Gauge, 18c. per lb.
Seamless Copper Tubing, 21c. per lb.

For other sizes see Manufacturers' List.

PRICES FOR SEAMLESS BRASS TUBING Iron Pipe Sizes.

Iron pipe Size	⅛	¼	⅜	½	¾	1	1¼	1½	2	2½	3	3½	4	4½	5	6
Price per lb.	26	25	20	19	18	18	18	18	18	18	18	19	20	22	24	25

PRICE LIST OF IRON LINED TUBING—NOT POLISHED.

	Per 100 feet Brass.	Bronze.
⅜ inch	$8	$9
½ inch	8	9
⅝ inch	10	11
¾ inch	12	13
⅞ inch	14	15
1 inch	18	20
1¼ inch	22	24
1¼ inch	25	27
1½ inch	32	35
1¾ inch	45	48
2 inch	56	60

Discount 55 and 5%.

PRICES FOR TOBIN BRONZE AND MUNTZ METAL.

Tobin Bronze Rod	16c.	net base
Muntz or Yellow Metal Sheathing (14" x 48")	14c.	" "
" " " Rectangular sheets other than Sheathing	16c.	" "
" " " Rod	14c.	" "

Above are for 100 lbs. or more in one order.

PLATERS' METALS.

Platers' bar in the rough, 22⅝c. net.

German silver platers' bars dependent on the percentage of nickel, quantity and general character of the order.

Platers' metal, so called, is very thin metal not made by the larger mills and for which prices are quoted on application to the manufacturers.

PRICES FOR SHEET BLOCK TIN AND BRITANNIA METAL.

Not over 18 in. in width, not thinner than 23 B. S. Gauge, 2c. above price of pig tin in same quantity.

Not over 35 in. in width, not thinner than 22 B. S. Gauge, 3c. above price of pig tin.

PRICE SHEET FOR SHEET ALUMINUM—B. & S. Gauge.

	Wider than.....	3in.	6in.	14in.	16in.	18in.	20in.	24in.	30in.	36in.
	and including.....	12in.	14in.	16in.	18in.	20in.	24in.	30in.	36in.	40in.
		in coils.								
No.	13 and heavier	34	34	36	36	36	36	39	39	39
"	14	34	34	36	36	36	36	39	39	39
"	15	34	34	36	36	36	36	39	39	39
"	16	34	34	36	36	36	36	39	39	39
"	17	34	34	36	36	36	36	39	39	39
"	18	34	34	36	36	36	36	39	39	42
"	19	34	34	36	36	36	36	39	40	43
"	20	34	36	36	36	36	38	41	42	44
"	21	34	38	38	38	38	40	43	44	50
"	22	34	38	38	38	40	40	43	47	51
"	23	34	38	38	38	40	40	43	49	52
"	24	34	38	40	42	42	42	45	51	54
"	25	36	39	41	43	43	43	46	53	57
"	26	36	39	42	46	46	46	51	55	61
"	27	36	40	44	48	48	49	54	58	64
"	28	36	40	46	48	49	49	56	62	67
"	29	38	41	48	50	52	52	61	67	72
"	30	38	42	50	52	56	62	69	72	77
"	31	43	47	55	58	63	71	74	77	83
"	32	45	49	57	61	69	77	91	90	95
"	33	47	51	60	65	73	84	91	100	110
"	34	50	55	62	70	78	91	103	110	120
"	35	..	65	70	80	90	100	115	125	..
"	36	..	80	90	100	115	120	135	..	..
"	37	..	104	114	129	144	159	174	..	..
"	38	..	124	139	154	169	184	204	..	..
"	39	..	144	164	184	204	224	..	..	..
"	40	..	174	204	224	244	..	..	..	..

In flat rolled sheets the above prices refer to lengths between 2 and 3 feet. Prices furnished by the manufacturers for wider and narrower sheet. All columns except the first refer to flat rolled sheet. Prices are 100 lbs. or more at one time. Less quantities 5c. lb. extra. Charges made for boxing.

PRICE LIST SEAMLESS ALUMINUM TUBING.

STUBS' GAUGE THE STANDARD. SIZES CARRIED IN STOCK.
Outside Diameters. BASE PRICE, 25 Cents per Pound.

Stubs' Gauge.	Inches.	¼ in.	5-16 in.	⅜ in.	½ in.	⅝ in.	¾ in.	⅞ in.	1 in.	1¼ in.	1½ in.	1¾ in.	2 ins.	2½ ins.	3 ins.	3½ ins.	4 ins.	4½ ins.
11.	.120.	..	..	..	..	..	..	..	27	24	..	..	14	20	10	9	16	23
12.	.109.	..	..	..	..	..	..	..	26	..	..	..	15	..	..	..	..	..
14.	.083.	..	..	..	..	..	..	..	..	..	..	..	17	..	..	..	..	..
16.	.065.	..	..	..	..	..	28	27	27	24	23	21	21	21	21	27	31	57
18.	.049.	..	..	..	..	33	30	29	28	25	26	26	26	..	..	..	..	..
20.	.035.	117	..	46	39	34	33	32	30	29	30	30	30	31	38	49	58	81
21.	.032.	..	..	..	40	..	..	..	..	..	..	..	..	..	..	..	..	..
22.	.028.	138	98	48	42	38	37	35	34	..	..	45	..	..	..	..	..	..
24.	.022.	188	133	108	88	79	73	62	60	66	..	..	..	..	..	..	..	..

Prices are for ten or more pounds at one time. For prices on sizes not carried in stock send for Manufacturers' List.

PRICE LIST FOR ALUMINUM ROD AND WIRE.

Diameter. B. & S.G'ge.	000 to No. 10.	No. 11.	No. 12.	No. 13.	No. 14.	No. 15.	No. 16.	No. 17.	No. 18.	No. 19.	No. 20.	No. 21.	No. 22.
Price, per lb....	32	32½	32½	33	33½	34	34½	35	36	37	38	43	46

PRICE LIST FOR GERMAN SILVER IN SHEETS AND ROLLS.

Per cent.	Price per lb.	Per cent.	Price per lb.
12	$0.52	16	$0.58
13	.53	17	.59
14	.54	18	.60
15	.55		

These prices are for sheets and rolls over 2 inches in width, to and including 8 inches in width and to No. 20, inclusive. American or Brown & Sharpe's Gauge. Prices are for 100 lbs. or more of one size and gauge in one order. Discount 50%.

GERMAN SILVER TUBING.

4	per cent.	to No. 19, B. & S. Gauge, inclusive		$0.60
6	"	" 19, " " "		.70
9	"	" 19, " " "		.85
12	"	" 19, " " "		1.00
15	"	" 19, " " "		1.15
16	"	" 19, " " "		1.20
18	"	" 19, " " "		1.30

German Silver Tubing thinner than No. 19 B. & S. Gauge add same advances as for Brazed Brass Tube.

For cutting to special lengths add same advances as for Brazed Brass Tube. Discount 40%.

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COPPER { SHEET ROD WIRE
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(for Coach Lamps)
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The tool is now on the market and is in use in 50 different brass shops and there is opportunity for a far greater sale.

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PLANTS—FOR SALE AND TO LET—Continued

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WANTED—SECOND-HAND HYDRAULIC PRESS for making wire solder. Address BOX 105, care THE METAL INDUSTRY.

WANTED—A 10 h. p. UPRIGHT BOILER. Must be in good condition and at low cost. Address S-1, care THE METAL INDUSTRY.

WANTED—Second-hand 6 or 8 h. p. horizontal engine and boiler. State what make, condition and price. Address HORIZONTAL, care THE METAL INDUSTRY.

WANTED—A copy of THE METAL INDUSTRY for February, 1905. Address FEBRUARY, care THE METAL INDUSTRY.

AGENCY

WANTED—The Agency for some American Hardware firms in England. Address HARDWARE, care THE METAL INDUSTRY.

TRADE WANTS

AN EXCHANGE FOR THE WANTS OF THE METAL TRADES

Advertisements will be inserted under this head at 40 cents per line, 3 lines one dollar, for each insertion, excepting Situations Wanted, which are 50 cents each insertion. Answers sent in our care will be forwarded

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INQUIRIES

Inquiries received by THE METAL INDUSTRY for Metals, Machinery and Supplies. Further particulars may be obtained by addressing the inquiry number, care THE METAL INDUSTRY. No charge for inserting these inquiries.

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Inquiry No. 332—We would like to correspond with the manufacturers of Sweep Reducing Furnaces.

Inquiry No. 333—We would like to correspond with the manufacturers of the "Herring Electric Furnace."

Inquiry No. 334—We would like to correspond with the manufacturers of copper clad wire.

Inquiry No. 335—We would like to correspond with the manufacturers of aluminum coating on steel plates.

Inquiry No. 336—We would like to correspond with the manufacturers of "Climax" parting.

Inquiry No. 337—We would like to correspond with firms making a specialty of manufacturing well-boring tools.

Inquiry No. 338—We would like to correspond with the manufacturers of phosphor bronze wire cloth for straining purposes.

Inquiry No. 339—We would like to correspond with the manufacturers of reverberatory furnaces.

Inquiry No. 340—We desire to use sheet tin in continuous lengths ¾ in. wide wound upon reels, and would like to correspond with the manufacturers of this material.

Inquiry No. 341—We would like to correspond with the manufacturers of aluminum strip in coils.

Inquiry No. 342—We would like to correspond with the manufacturers of metal dross furnaces.

Inquiry No. 343—We would like to correspond with a reliable broker, jobber or commission house who can handle our line of aluminum hair combs.

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WANTED—SUPERINTENDENT, METAL DEPARTMENT, of a large manufacturing concern. One who thoroughly understands the making and finishing of articles from sheet metals. No one who is not thoroughly experienced need apply. Permanent position to right party. Address METAL EXPERT, care THE METAL INDUSTRY.

ROLLING MILL EXPERTS

WANTED—A capable young man under thirty-five, to supervise SHEET ROLLING DEPARTMENT of well-established industry. Technical graduate preferred. Address SUPERVISOR, care THE METAL INDUSTRY.

WANTED—MANAGING SUPERINTENDENT to take charge of a ROLLING MILL manufacturing COPPER AND BRASS SHEETS, TUBES and RODS. This job offers a splendid opportunity for a competent man. For particulars, apply J. F. BROWN, 185 Yonge street, Toronto, Ont., Canada.

SALESMEN

WANTED—SALESMAN to sell throughout New England a well-established machine made by an old reliable company and used in the plating, textile and other trades. A good opening for a reliable man. Address NEW ENGLAND, care THE METAL INDUSTRY.

SMELTER AND ASSAYER

WANTED—EXPERIENCED ASSAYER for PLATINUM ASSAYS; steady position. State age, experience and salary wanted; also give references. Address PLATINUM ASSAYER, care THE METAL INDUSTRY.

WANTED—A good man who is thoroughly conversant in both electrolytic and general smelting and assaying. A good opening for such a man. Address ELECTROLYTIC, care THE METAL INDUSTRY.

SITUATIONS OPEN—Continued

CORE MAKER

WANTED—METAL FOREMAN experienced in handling men and capable in drawing steel No. 24 U. S. and No. 28 U. S., and familiar with machine and hand spinning. State full particulars and give reference. Excellent opportunity for a thorough mechanic who can produce results. Address, METAL FOREMAN, care THE METAL INDUSTRY.

WANTED—First-class CORE MAKER, in a large JOBBING BRASS FOUNDRY employing about 35 molders. To take entire charge of core room. Must be good, steady, competent and experienced man. State experience and salary expected. Address M. J. B., care THE METAL INDUSTRY.

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WANTED—A MANAGING SUPERINTENDENT capable of taking complete charge of a DIE CASTING PLANT in CANADA, preferably one who can become interested financially and act as director. Address CANADA MANAGER, care THE METAL INDUSTRY.

PLATERS AND POLISHERS

WANTED—Foreman for Plating Works, one who understands the Mechanical Electro-Plating Machines. Fine chance for the right man. Give age, experience and wages wanted. All answers kept confidential. Address "FOREMAN," care THE METAL INDUSTRY.

NAME PLATE PRINTER

WANTED—NAME PLATE PRINTER. Workman who can operate hand press for etched plate work. Address ETCHED PLATE, care THE METAL INDUSTRY.

TINWARE FOREMAN

WANTED—An experienced FOREMAN to take charge of TINWARE ASSEMBLING DEPARTMENT, in a large TINWARE FACTORY. Address TINWARE, care THE METAL INDUSTRY.

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Advertisements Under This Heading 50 Cents Each Insertion.

EXECUTIVE

SITUATION WANTED—I am desirous of making a change in September. For the past four years I have been GENERAL MANAGER of a leading plant making PLUMBING SUPPLIES and previous seven years general office and factory experience. Age 31, married, active, energetic and thoroughly capable. Correspondence solicited and references exchanged. Address, PLUMBING MANAGER, care THE METAL INDUSTRY.

SITUATION WANTED—Open for position on July 15th, a thorough factory man of 18 years' experience in the manufacturing of brass goods, with modern methods, up-to-date on system, economical tool design and equipment, cost of production, etc. Correspondence invited. Address FACTORY MAN, care THE METAL INDUSTRY.

SITUATION WANTED—BRASS FOUNDRY SUPERINTENDENT or FOREMAN. Thoroughly experienced on ALUMINUM CASTINGS for automobiles, valve, pump and general jobbing lines. Thirty-two years old, temperate and a hustler. Well up on molding machines and mixing metals. Address 0-2, care THE METAL INDUSTRY.

SITUATION WANTED—Position as MANAGER or SUPERINTENDENT with concern manufacturing BRASS GOODS. Technical graduate, married, sober, industrious and energetic, 30 years old, experienced on PLUMBERS' BRASS GOODS, BUILDERS' HARDWARE, etc.; INTERCHANGEABLE PARTS, modern methods, executive, cost accountant. References. Address R., care THE METAL INDUSTRY.

PROFESSIONAL

SITUATION WANTED—Young man, 19, at present attending Cooper Union Chemical School evenings, wishes to begin with a manufacturing concern where advancement is assured. Can furnish highest references as to character and ability. Position must be in New York City or immediate vicinity. M. O., 125 Suffolk St.

SITUATION WANTED—By a practical STEAM and ELECTRICAL ENGINEER, 2nd class N. Y. license; wishes steady employment. Holding a responsible position for the last 8 years with a large modern electrical plant. Good reference; capable of taking charge. Address T. S., care THE METAL INDUSTRY.

TRADE WANTS

AN EXCHANGE FOR THE WANTS OF THE METAL TRADES

Advertisements will be inserted under this head at 40 cents per line, 3 lines one dollar, for each insertion, excepting Situations Wanted, which are 50 cents each insertion. Answers sent in our care will be forwarded

SITUATIONS WANTED—Continued

Advertisements Under This Heading 50 Cents Each Insertion

SALESMAN

SITUATION WANTED—AS SALESMAN in New York or western territory with manufacturer of brass and copper goods, sheet, rod, wire and tubing. Have had 8 years' experience and wide acquaintance with trade. Address BOX 106, care THE METAL INDUSTRY.

ROD ROLLER

SITUATION WANTED—As ROD ROLLER in Brass Rod Mill. Have had charge of a rod mill for years. Can furnish the best of reference. Address ROD ROLLER, care THE METAL INDUSTRY.

PATTERN MAKER

SITUATION WANTED—FOREMAN METAL PATTERN MAKER experienced on steam specialties and plumbers' brass goods, also the manufacture of general brass goods. Address B, care THE METAL INDUSTRY.

FOUNDERS

SITUATION WANTED By a BRASS FOUNDRY FOREMAN, Can do my own mixing, and can handle crucible or Schwartz furnaces. Can also control help, and molding machines to advantage in the manufacture of valves, cocks, fittings, etc. Address B. F., care THE METAL INDUSTRY.

SITUATION WANTED—WORKING BRASS FOUNDRY FOREMAN. First-class False Core Molder. Architect on bronze and chandelier work. Twenty years' experience; last five years foreman. Address FALSE CORE MOLDER, care THE METAL INDUSTRY.

SITUATION WANTED—FOREMAN CHANDELIER or ARCHITECTURAL BRONZE CONSTRUCTION. Factory or outside position. Capable of handling men to best advantage. Would also consider salesmanship with well established house. Address D. E., care THE METAL INDUSTRY.

SITUATION WANTED—By a BRASS FOUNDRYMAN. Can do my own mixing, handle crucible or oil furnaces. Can control help to good advantage. Can offer a good proposition if you are in need of such a man. Address, BRASS FOUNDRYMAN, care THE METAL INDUSTRY.

SITUATION WANTED—By a PLASTER COMPOSITION FOUNDRYMAN with 9 years' experience at fine arts castings in metals, plaster, wax and glue; also for patterns for engraving machines. Address P. C. F., care THE METAL INDUSTRY.

SITUATION WANTED—BRASS FOUNDRY FOREMAN desires a position in a foundry just starting. Can give best results in machine moldings and furnaces. Can look after the making up of patterns to see that they give good results in molding and finishing. Can mix metals for any work desired, enabling you to meet all competitors. Address, M. B., care THE METAL INDUSTRY.

SITUATION WANTED—WORKING BRASS FOUNDRY FOREMAN, all round man. Brass, Bronze and Aluminum. Understands machines; good mixer and melter. Age 50. Sober and steady. Address J-26, care THE METAL INDUSTRY.

SITUATION WANTED—By ALUMINUM FLOOR MOLDER thoroughly familiar with heavy and light work. Have had 19 years' experience. Address N. J., care THE METAL INDUSTRY.

BRASS FINISHER

SITUATION WANTED—FOREMAN BRASS FINISHER, practical mechanic who has had foreman's experience and well versed in the up-to-date methods of manufacture of plumbers' and steamfitters' supplies; repair jobbing and specialty work; 18 years' experience; good references. Address FOREMAN BRASS FINISHER, care THE METAL INDUSTRY.

SPINNER

SITUATION WANTED—SPINNER, 44 years old, with many years' experiene on round and oval work in silver, aluminum, brass, copper, etc., wishes position. Address J-22, care THE METAL INDUSTRY.

ETCHER

SITUATION WANTED—Thoroughly practical transfer etcher on silver, brass, copper and organic substances, desires to make a change. Good recommendations. Address X. T., care THE METAL INDUSTRY.

GALVANIZER

SITUATION WANTED—By an expert GALVANIZER. Specialty is conduit pipes, also the making of one of the best black enamels for conduit pipes. Address, CONDUIT, care THE METAL INDUSTRY.

PLATERS AND POLISHERS

ELECTROPLATERS

Any one desiring the services of first class men for the electrodeposition of metals and finishing in all branches and departments of the plating business can secure such services by corresponding with the Secretary of the National Electro-Platers' Association, Royal F. Clark, 246 Fulton Street, Jersey City, N. J.

SITUATION WANTED—PLATER, BUFFER and POLISHER, now working, desires position in the East where mental effort and ability would be tolerated. Plates in copper, brass, bronze, nickel, silver, gold, platinum, zinc and tin. Makes all chandelier, hardware and art metal finishes. Can install economic and efficient system. Address EXPERT PLATER, care THE METAL INDUSTRY.

SITUATION WANTED—PLATER desires a position as FOREMAN. Expert on solutions and finishes. BRASS and NICKEL plating a specialty. Address HARDWARE PLATER, care THE METAL INDUSTRY.

SITUATION WANTED—I would like to correspond with a firm who desires the services of a good, reliable plater. Would prefer position in New York City or vicinity. Address J-25, care THE METAL INDUSTRY.

SITUATION WANTED—By a PLATER with several years' experience on Nickel, Brass, Copper, Bronze Solutions, oxidizing and dipping. Address J-23, care THE METAL INDUSTRY.

WANTED—To correspond with a MR. ZEIDMAN who we understand is employed in a polishing or plating plant in New York City or vicinity. Address BOX 107, care THE METAL INDUSTRY.

SITUATION WANTED—By a GILDER EXPERT on shades of GOLD COLORING. Age 35. Position in Newark or New York City preferred. Address JEWELRY, care THE METAL INDUSTRY.

SITUATION WANTED—By a PLATER. First-class man on nickel, brass, copper, silver, black nickel; understands all hardware finishes, etc. Address N-2, care THE METAL INDUSTRY.

SITUATION WANTED—By a FOREMAN PLATER who is up to date on all finishes and colors. Desires a position with a good firm. Salary $30 per week. Address D-1, care THE METAL INDUSTRY.

TRADE WANTS

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SITUATIONS WANTED—Continued

Advertisements Under This Heading 50 Cents Each Insertion

PLATERS AND POLISHERS—Continued

SITUATION WANTED—By ELECTRO-PLATER with over 20 years' experience. Thoroughly understands all branches of plating, dipping, bronzing, etc. Address A-2, care THE METAL INDUSTRY.

SITUATION WANTED—By a PLATER having had ten years' experience on all metals and finishes. Can furnish best of reference. Address CONNECTICUT, care THE METAL INDUSTRY.

SITUATION WANTED—Position as ELECTRO-GILDER and PLATER. Expert worker in jobbing, gilding and plating. Address JOB GILDER, care THE METAL INDUSTRY.

SITUATION WANTED—SILVER AND GOLD PLATER desires a position as FOREMAN. Have had 12 years' experience and am well versed in chemistry. Address, ELECTRO, care THE METAL INDUSTRY.

SITUATION WANTED—By an ELECTRO-PLATER, 18 years' experience with Nickel, Copper, Brass and Bronze solutions and oxidizing. Can furnish good reference. Address BOX M-9, care THE METAL INDUSTRY.

SITUATION WANTED—PLATER, expert on all finishes in GOLD, SILVER, NICKEL, COPPER, BRASS OXIDIZING, BRONZING, etc. on fancy metal goods. Can do work in the cheapest way. Also expert on solid gold and silver. Understands the making of all solutions. Can install plating department, if necessary, and take charge. Have had 10 years' experience. Can furnish references to any firm offering a steady position. If references are required give full details of position in first letter. Address, PLATER, care Weiner, 398 Grand street, New York City.

SITUATION WANTED—By a PLATER of 12 years' experience. Thoroughly familiar with all finishes. Address, L. J., care THE METAL INDUSTRY.

SITUATION WANTED—Expert up-to-date NOVELTY ELECTRO-PLATER who has run the largest jewelry plant in the East. Address BOX 101, care THE METAL INDUSTRY.

SITUATION WANTED—By a FOREMAN-PLATER who thoroughly understands the plating business from A to Z. Has had several years' experience and is capable of taking charge. Address P. H., care THE METAL INDUSTRY.

See Page 50 for List of Books and Special Offer to Subscribers

THE METAL INDUSTRY BOOKS

AND SPECIAL OFFER TO SUBSCRIBERS

THE FIRST COLUMN OF FIGURES GIVES THE PRICE OF THE BOOK ALONE. THE SECOND COLUMN OF FIGURES GIVES THE PRICE OF THE BOOK INCLUDING A YEAR'S SUBSCRIPTION TO THE METAL INDUSTRY

METALLURGICAL

ELECTRO-METALLURGY—A PRACTICAL TREATISE. Third Edition, revised and enlarged. Walter G. McMillan, F. I. C. M. Revised by W. R. Cooper. 8½ x 6 inches; 425 pages; 113 illustrations $4.00 $4.50

This book, which is the third edition of the work on Electro-Metallurgy, which was published in 1890, has been completely revised, enlarged and brought up to date. The book in itself is a combination of electro-metallurgy and electro-chemistry, and also gives a wonderful amount of information regarding the elements which are so electrically treated.

METALLIC ALLOYS. G. H. Gulliver. 6 x 8 inches; 254 pages; 102 illustrations 2.00 2.50

A very valuable book bearing upon the theoretical relations between the chemical constitution and the physical structure of an alloy, and its mechanical and other useful properties. In this work the binary and ternary alloys are treated in a very complete and able manner and all of the conditions under which such alloys are formed are discussed. A good book to go with Metallography.

ALUMINUM. J. W. Richards. 5½ x 9 inches, 627 pages; 44 illustrations 6.00 6.50

Embraces history of aluminum, occurrence, physical and chemical properties, properties and preparation of aluminum compounds, alloys of aluminum, etc., etc.

ALLOYS, BRASSES AND BRONZES. R. H. Thurston, M. A. 5½ x 9 inches; 574 pages; illustrated. 2.50 3.00

A history and properties of the metals and their alloys; manufacture and working of alloys; strength and elasticity of non-ferrous metals, bronzes, brasses, kalchoids, and of zinc tin.

THE ART OF THE GOLDSMITH AND JEWELER. T. B. Wigley, 6 x 8½ inches; 249 pages with index; 144 illustrations $2.75 $3.25

Just the book for the manufacturing jeweler and goldsmith. A complete description is given of the cutting of diamonds and precious stones. There are also chapters on the metallurgy of gold, rolling and slitting gold, enameling, coloring and finishing of jewelry, etc., and a large amount of useful information.

ELECTRO-METALLURGY. J. B. C. Kershaw. 6 x 8½ inches; 300 pages and index; 61 illustrations 2.00 2.50

The brand of metallurgy which deals with the extraction and refining of metals by aid of electricity is dealt with very authoritatively in this book. A brief and clear account of the industrial development of electro-metallurgy is given by the author in such style as to be understood by those whose acquaintance with either chemistry or electricity is slight. A companion book to Electro-Metallurgy by McMillan.

METALLOGRAPHY. Cecil H. Desch. 5¼ x 7½ inches; 432 pages; 14 plates and 108 diagrams ... 3.00 3.50

A brand new book upon a most interesting subject to the worker in brass. This is one of the best books yet published on the subject of microscopical examination of metals and is a work that no chemist or metallurgist should be without.

ARITHMETIC OF THE GOLD AND SILVERSMITH. William Jockin. 5¼ x 7½ inches; 56 pages 1.25 1.75

A concise description of the methods used in the conversion and alloying of gold and silver, referring particularly to the arithmetic of the art.

MECHANICAL

METAL WORKING. Paul N. Hasluck. 7 x 9½ inches; 760 pages with index; 2,206 illustrations and working drawings $2.50 $3.00

A book for the handy man, containing descriptions of tools, materials and processes. The scope of the work includes foundry and smith's work, giving detailed instructions in all operations pertaining to the above industries, the working of sheet metal, including the soldering, brazing, refining, annealing, hardening, tempering, etc., being particularly complete. A veritable encyclopædia of mechanical processes relating to all the metals.

SILVER WORK AND JEWELRY. H. Wilson, 5 x 7½ inches; 338 pages; illustrated; glossary and index 1.50 2.00

The best text book for students and workers in metal. The work is prepared by an expert, and the subject is covered in a plain and concise manner, with the aid of many clear drawings. For the most part the descriptions deal with work actually carried out. Good for the beginner as well as the expert.

METAL WORKER'S HANDY BOOK OF RECEIPTS AND PROCESSES. William T. Brannt. 5½ x 6½ inches; 538 pages with index 2.50 3.00

This work is a collection of chemical formulas and practical manipulations for the working of all the metals and alloys; including the decoration and beautifying of articles manufactured therefrom, as well as their preservation. A valuable addition to the library.

CHEMICAL

ELECTRO-PLATING AND ELECTRO-REFINING OF METALS. Watt and Phillip. 6 x 8 inches; 680 pages; 160 illustrations $4.50 $5.00

This is the well-known classic of Alexander Watt revised and extended by Arnold Phillip. It is seldom that we can find a book devoted to such a monumental subject as the electro-deposition of metals that is satisfactorily complete and covers the ground so thoroughly as the present work. The book should be the side partner of anyone engaged or interested in the art of depositing metals by electricity.

DECORATIVE GLASS PROCESSES. A. L. Duthie. 6 x 8½ inches; 269 pages and glossary; 38 illustrations 2.00 2.50

An important book dealing with the decoration of the various kinds of glass met with in the arts. Among the chapters we find treated the comparative prices and characteristics of the several varieties of glass—leaded, lights, stained glass, embossed glass, brilliant cutting and beveling, sand blast and crystalline glass, gilding, silvering and mosaic work, etc. A very good book on the subject.

ART ENAMELING ON METALS. Henry Cunynghame. 5¼ x 7¾ inches; 188 pages; illustrated .. 2.00 2.50

The art of enameling is treated from a practical standpoint. Every step in the process, from the selection of the design to the final work, is treated in a plain and comprehensive way. The book is of great value to the one familiar with the art as well as to the student.

BOOKS ON ANY METALLURGICAL, MECHANICAL OR CHEMICAL SUBJECT SENT PREPAID TO ANY ADDRESS IN THE WORLD UPON RECEIPT OF PRICE. IF THE PRICE OF BOOK IS UNKNOWN, INQUIRE OF

THE METAL INDUSTRY, 99 JOHN STREET, NEW YORK

CLASSIFIED INDEX OF ADVERTISEMENTS AND BUYERS' GUIDE

Accumulators, Hydraulic
Watson-Stillman Co., New York.
Wood, R. D., & Co., Philadelphia, Pa.

Acid, Hydrofluoric (See also Platers' Supplies).
General Chemical Co., Philadelphia, Pa.
Kalbfleisch, Franklin H., Co., New York.
McKesson & Robbins, New York.

Acid, Muriatic (See also Platers' Supplies.)
Grasselli Chemical Co., Cleveland, O.
Niagara Alkali Co., Niagara Falls, N. Y.

Acid, Sulphuric (See also Platers' Supplies).
Grasselli Chemical Co., Cleveland, O.
Illinois Zinc Co., Peru, Ill.
Kalbfleisch, Franklin H., Co., New York.
Matthiesen & Hegeler Zinc Co., La Salle, Ill.
McKesson & Robbins, New York.

Air Compressors.
Eclipse Air Brush & Compressor Co., Bloomfield, N. J.
Eureka Pneumatic Spray Co., New York.
Nicholls, W. H., New York.
Pangborn, Thomas W., Company, New York.

Air Filters.
Eclipse Air Brush & Compressor Co., Bloomfield, N. J.
Eureka Pneumatic Spray Co., New York.

Alloys Made to Specifications.
Ajax Metal Co., Philadelphia, Pa.
Allan, A., & Son, New York.
America Manganese Bronze Co., New York.
Birkenstein, S., & Sons, Chicago, Ill.
Clum & Atkinson, Rochester, N. Y.
Damascus Bronze Co., Pittsburg, Pa.
Electric Smelting & Alum'n Co., Lockport, N. Y.
Genessee Metal Co., Rochester, N. Y.
Leavitt, C. W., & Co., New York.
Michigan Smelting & Refining Co., Detroit, Mich.
National Metal Reduction Co., Cleveland, O.
North American Smelting Co., Philadelphia, Pa.
Reeves, Paul S., & Son, Philadelphia, Pa.
Riverside Metal Co., Riverside, N. J.
Standard Rolling Mills Inc., Brooklyn, N. Y.

Aluminum Bronze Ingots.
Electric Smelting & Alum'n Co., Lockport, N. Y.

Aluminum Castings.
Aluminum Company of America, Pittsburg, Pa.
Aluminum Goods Mfg. Co., Manitowoc, Wis.
Clum & Atkinson, Rochester, N. Y.
Light Foundry & Mfg. Co., Pottstown, Pa.
Reeves, Paul S., & Sons, Philadelphia, Pa.

Aluminum Electrical Conductors.
Aluminum Company of America, Pittsburg, Pa.

Aluminum, Granulated
U. S. Reduction Co., Chicago, Ill.
Standard Rolling Mills Inc., Brooklyn, N. Y.

Aluminum Ingots.
Aluminum Company of America, Pittsburg, Pa.
American Smelting & Refining Co., Cincinnati, O.
Birkenstein, S., & Sons, Chicago, Ill.
Electric Smelting & Alum'n Co., Lockport, N. Y.
Guiterman, Rosenfeld & Co., New York.
Kemp, W. H., Co., New York.
Leavitt, C. W. & Co., New York.
Michigan Smelting & Refining Co., Detroit, Mich.
Richards & Co., Boston, Mass.
Standard Rolling Mills Inc., Brooklyn, N. Y.
U. S. Reduction Co., Chicago, Ill.

Aluminum Match Plates.
McPhee, Hugh, Tarrytown, N. Y.

Aluminum Powder, Leaf and Foil.
Kemp, W. H., Co., New York.

Aluminum Manufactured Goods, Sheet
Aluminum Goods Mfg. Co., Manitowoc, Wis.
(See also Metal Goods made to order).

Aluminum Moldings and Extruded Shapes.
Aluminum Co. of America, Pittsburg, Pa.

Aluminum Rivets
Hassall, John, Inc., Brooklyn, N. Y.
Kemp, W. H., Co., New York.

Aluminum Sheets, Rods and Wire.
Aluminum Company of America, Pittsburg, Pa.
Electric Smelting & Alum'n Co., Lockport, N. Y.
Kemp, W. H., Co., New York.
Pilling Brass Co., Waterbury, Conn.
Richards & Co., Boston, Mass.
Standard Rolling Mills, Inc., Brooklyn, N. Y.
U. S. Reduction Co., Chicago, Ill.

Aluminum Solder (See Soldier).

Aluminum Tubes.
Aluminum Company of America, Pittsburg, Pa.
Ellwood Ivins Tube Works, Philadelphia, Pa.
Kemp, W. H., Co., New York.

Ammeters and Voltmeters (See also Platers' Supplies).
Bristol Co., The, Waterbury, Conn.
Sangamo Electric Co., Springfield, Ill.

Amyl Acetate (See also Platers' Supplies).
McKesson & Robbins, New York.
Nickolas, G. J., & Co., Chicago, Ill.

Annealing Machines, Automatic
Bates & Peard Annealing Furnace Co., New York.

Anodes, Brass or Copper (See also Platers' Supplies).
Detroit Foundry Supply Co., Detroit, Mich.
Hanson & Van Winkle Co., Newark, N. J.
Hussey, C. G., & Co., Pittsburg, Pa.
Seymour Manufacturing Co., The, Seymour, Conn.
U. S. Electro Galvanizing Co., Brooklyn, N. Y.

Anodes, Nickel (See also Platers' Supplies).
Detroit Foundry Supply Co., Detroit, Mich.
Hanson & Van Winkle Co., Newark, N. J.
McKesson & Robbins, New York.
Munning-Loeb Co., Matawan, N. J.
Seymour Manufacturing Co., The, Seymour, Conn.
U. S. Electro Galvanizing Co., Brooklyn, N. Y.

Anodes, Platinum (See also Platers' Supplies).

Anodes, Silver (See also Platers' Supplies).
Detroit Foundry Supply Co., Detroit, Mich.
Jackson, John J., Newark, N. J.
Renziehausen, Wm. F., Co., Newark, N. J.

Anodes, Zinc (See also Platers' Supplies).
Grasselli Chemical Co., Cleveland, O.

Antimony Metal.
American Smelting & Refining Co., Cincinnati, O.
Birkenstein, S., & Sons, Chicago, Ill.
Hendricks Bros., New York.
Leavitt, C. W., & Co., New York.
McKesson & Robbins, New York.
Michigan Smelting & Refining Co., Detroit, Mich.
Richards & Co., Boston, Mass.
U. S. Reduction Co., Chicago, Ill.

Assayers (See Chemists and Assayers).

Automatic Cock Grinder.
Turner Machine Co., Philadelphia, Pa.

Babbitt Metals.
American Manganese Bronze Co., New York.
American Smelting & Refining Co., Cincinnati, O.
Benson, H. K. & F. S., Glen Ridge, N. J.
Birkenstein, S. & Sons, Chicago, Ill.
Clum & Atkinson, Rochester, N. Y.
Electric Smelt. & Aluminum Co., Lockport, N. Y.
Merchant & Evans Co., Philadelphia, Pa.
Michigan Smelting & Refining Co., Detroit, Mich.
National Metal Reduction Co., Cleveland, O.
North American Smelting Co., Philadelphia, Pa.
Reeves, Paul S., & Son, Philadelphia, Pa.
Richards & Co., Boston, Mass.
Riverside Metal Co., Riverside, N. J.

Balls, Steel, for Burnishing
Abbott Ball Co., Hartford, Conn.
Globe Machine & Stamping Co., Cleveland, O.

Bismuth.
Hendricks Brothers, New York.
Leavitt, C. W., & Co., New York.
McKesson & Robbins, New York.
Michigan Smelting & Refining Co., Detroit, Mich.
Richards & Co., Boston, Mass.

Block Tin (See Tin).

Block Tin Pipe.
North American Smelting Co., Philadelphia, Pa.
Standard Rolling Mills, Inc., Brooklyn, N. Y.

Blow Piping.
Cleveland Blow Pipe & Mfg. Co., Cleveland, O.
Kirk & Blum, Cinnati, O.
Knickerbocker Company, Jackson, Miss.

Brass and Bronze Architectural Work.
Manhattan Brass Co., New York.

Brass and Bronze Covered Iron Tubes.
Phenix Tube Co., Brooklyn, N. Y.

Brass Castings.
American Manganese Bronze Co., New York.
Clum & Atkinson, Rochester, N. Y.
North American Smelting Co., Philadelphia, Pa.
Reeves, Paul S., & Son, Philadelphia, Pa.
Riverside Metal Co., Riverside, N. J.
Sargent Mfg. Co., Newark, N. J.

Brass Ingots.
American Manganese Bronze Co., New York.
American Smelting & Refining Co., Cincinnati, O.
Birkenstein, S., & Sons, Chicago, Ill.
Genessee Metal Co., Rochester, N. Y.
Illinois Smelting & Refining Co., Chicago, Ill.
Merchant & Evans Co., Philadelphia, Pa.
Michigan Smelting & Refining Co., Detroit, Mich.
North American Smelting Co., Philadelphia, Pa.
Reeves, Paul S., & Son, Philadelphia, Pa.
Richards & Co., Boston, Mass.
Riverside Metal Co., Riverside, N. J.
Taunton-New B'rfd Copper Co., New Bedford, Mass.
Whipple & Choate, Bridgeport, Conn.
White & Bro., Inc., Philadelphia, Pa.

Brass, Bronze or Copper Sheet, Wire, Rod, Etc.
American Manganese Bronze Co., New York.
Ansonia Brass & Copper Co., The, New York.
Benson, H. K. & F. S., Glen Ridge, N. J.
Bridgeport Brass Co., Bridgeport, Conn.
Buffalo Copper & Brass Rolling Mill, Buffalo, N. Y.
Damascus Bronze Co., Pittsburg, Pa.
Hendricks Bros., New York.
Hussey, C. G., & Co., Pittsburg, Pa.
Manhattan Brass Co., New York.
Merchant & Evans Co., Philadelphia, Pa.
Pilling Brass Co., Waterbury, Conn.
Reeves, Paul S., & Son, Philadelphia, Pa.
Richards & Co., Boston, Mass.
Riverside Metal Co., Riverside, N. J.
Scovill Manufacturing Co., Waterbury, Conn.
Seymour Manufacturing Co., The, Seymour, Conn.
Taunton New B'rfd Copper Co., New Bedford, Mass.

Brass, Bronze or Copper Tubes.
Ansonia Brass & Copper Co., The, New York.
Bridgeport Brass & Copper Co., The, New York.
Buffalo Copper & Brass Rolling Mill, Buffalo, N. Y.
Ellwood Ivins Tube Works, Philadelphia, Pa.
Linton & Co., Providence, R. I.
Manhattan Brass Co., New York.
Merchant & Evans Co., Philadelphia, Pa.
Phenix Tube Co., Brooklyn, N. Y.
Reeves, Paul S., & Son, Philadelphia, Pa.
Riverside Metal Co., Riverside, N. J.
Scovill Manufacturing Co., Waterbury, Conn.
Seymour Manufacturing Co., The Seymour, Conn.
Waterbury Brass Co., Waterbury, Conn.
Wells, A. H., Co., Waterbury, Conn.

Brass Goods, Plumbers'
Manhattan Brass Co., New York.

Brazing—Brass, Iron, Etc.
Morgan Manufacturing Co., Newport, R. I.

Britannia Metal.
Benson, H. K. & F. S., Glen Ridge, N. J.
Standard Rolling Mills, Inc., Brooklyn, N. Y.
Toothill, John, Rochelle Park, N. J.

Bronze Ingots and Castings.
Ajax Metal Co., Philadelphia, Pa.
Allan, A., & Son, New York.
American Manganese Bronze Co., New York.
Ansonia Brass & Copper Co., The, New York.
Clum & Atkinson, Rochester, N. Y.
Damascus Bronze Co., Pittsburg, Pa.
Genesee Metal Co., Rochester, N. Y.
Naulty Smelting & Ref'g Co., Philadelphia, Pa.
North American Smelting Co., Philadelphia, Pa.
Reeves, Paul S., & Son, Philadelphia, Pa.
Richards & Co., Boston, Mass.
Riverside Metal Co., Riverside, N. J.
Taunton-New B'fd Copper Co., New Bedford, Mass.

Bronze Sheets, Wire, Rods, Etc. (See Brass, Bronze and Copper Sheets, etc.).

Bronze Tubes (See Brass, Bronze and Copper Tubes).

Brushes, Wire and Bristle (See also Foundry Supplies and Platers' Supplies).
Blumenthal, Hermann, New York.
Osborn Manufacturing Co., Cleveland, O.
Paxson, J. W. Co., Philadelphia, Pa.
Riehl Manufacturing Co., Cleveland, O.

Buckle Tongues.
Campbell-Warner Co., Middletown, Conn.

Buffing Compositions (See also Platers' Supplies).
American Tripoli Co., Seneca, Mo.

Buffing and Polishing Supplies (See Polishing and Buffing Machinery and Equipment).

Buffing and Polishing Wheels (See also Platers' Supplies).
Divine Brothers Co., Utica, N. Y.

Bull-Dozers
Wood, R. D., & Co., Philadelphia, Pa.

Burners, Fuel Oil or Gas (See also Foundry Supplies).
Detroit Foundry Supply Co., Detroit, Mich.
Fisher, Alfred, Chicago, Ill.
Hawley Down Draft Furnace Co., Chicago, Ill.
Monarch Eng. & Mfg. Co., Baltimore, Md.
Pangborn, Thomas W., Company, New York.
Rockwell Furnace Co., New York.
Rockwell, W. S., Co., New York.

Burnishing Barrels (See also Platers' Supplies).
Abbott Ball Co., Hartford, Conn.
Baird Machine Co., Oakville, Conn.
Globe Machine & Stamping Co., Cleveland, O.
Smith & Richardson, Attleboro, Mass.
Tolhurst Machine Works, Troy, N. Y.

Burnishing Barrels, Leather Mesh for
Peckham Mfg. Co., Newark, N. J.

Cabbaging Presses.
Farrell Foundry & Machine Co., Ansonia, Conn.
Wood, R. D., & Co., Philadelphia, Pa.
Waterbury (Conn.) Farrel Foundry & Machine Co.
Watson-Stillman Co., New York.

Cadmium, Metallic
Grasselli Chemical Co., Cleveland, O.
Leavitt, C. W., & Co., New York.
McKesson & Robbins, New York.
Richards & Co., Boston, Mass.

Castings. (See also name of metal wanted).

Castings, Iron Machinery
Bliss Co., E. W., Brooklyn, N. Y.
Farrel Foundry & Machine Co., Ansonia, Conn.
Waterbury (Conn.) Farrel Foundry & Machine Co.
Wood, R. D., & Co., Philadelphia, Pa.

Centrifugal Dryers and Extractors
Tolhurst Machine Works, Troy, N. Y.

Chaplets, Perforated
Hill & Griffith Co., Cincinnati, O.

Chemicals (See Platers' Supplies).

Chemists and Assayers.
Detroit Testing Laboratory, Detroit, Mich.
Krom, L. J., New York.
Ledoux & Co., New York.
McKesson & Robbins, New York.
Renziehausen, Wm. F., Newark, N. J.

Chemists, Manufacturing
Grasselli Chemical Co., Cleveland, O.
International Chemical Co., Camden, N. J.
Klipstein, A., & Co., New York.
McKesson & Robbins, New York.
Niagara Alkali Co., Niagara Falls, N. Y.
Roessler & Hasslacher Chemical Co., New York.
Swan & Finch Co., New York.

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Chromium Bronze.
Naulty Smelting & Refining Co., Philadelphia, Pa.

Chucks, Spinning
Bliss, E. W., Co., Brooklyn, N. Y.
Pryibil, P., New York.

Cock Grinder, Automatic
Turner Machine Co., Philadelphia, Pa.

Composition Metal Ingots and Castings.
Ajax Metal Co., Philadelphia, Pa.
Allan, A., & Son, New York.
American Manganese Bronze Co., New York.
Eastern Metal & Refining Co., Boston, Mass.
North American Smelting Co., Philadelphia, Pa.
Reeves, Paul S., & Son, Philadelphia, Pa.
Riverside Metal Co., Riverside, N. J.
White & Bro., Inc., Philadelphia, Pa.

Composition Metal Tacks, Nails, Etc.
Hussey, C. G., & Co., Pittsburg, Pa.

Conveyors.
Nicholls, Wm. H., New York.
Pangborn, Thomas W., Company, New York.

Copper, Carbonate of
Detroit Foundry Supply Co., Detroit, Mich.

Copper Castings.
American Manganese Bronze Co., New York.
Reeves, Paul S., & Son, Philadelphia, Pa.

Copper Ingots.
American Smelting & Refining Co., Cincinnati, O.
Birkenstein, S., & Sons, Chicago, Ill.
Hendricks Brothers, New York.
Leavitt, C. W., & Co., New York.
Merchant & Evans Co., Philadelphia, Pa.
Michigan Smelting & Refining Co., Detroit, Mich.
North American Smelting Co., Philadelphia, Pa.
Richards & Co., Boston, Mass.
Riverside Metal Co., Riverside, N. J.
Standard Rolling Mills, Inc., Brooklyn, N. Y.
Taunton-New B'fd Copper Co., New Bedford, Mass.
Vogelstein, L., & Co., New York.
White & Bro., Inc., Philadelphia, Pa.

Copper Nails and Tacks.
Hassall, John, Inc., New York.
Hussey, C. G., & Co., Pittsburg, Pa.
Scovill Manufacturing Co., Waterbury, Conn.
Taunton-New B'fd Copper Co., New Bedford, Mass.

Copper Rivets.
Hassall, John, Inc., New York.
Hendricks Bros., New York.

Copper Sheets, Wire, Rods, Bolts, Etc. (See Brass and Copper Sheets, etc.)

Copper, Shot
Seymour Manufacturing Co., Seymour, Conn.

Copper, Sulphate of
Grasselli Chemical Co., Cleveland, O.

Copper Tubes (See Brass and Copper Tubes)

Core Compound (See also Foundry Supplies).
Detroit Foundry Supply Co., Detroit, Mich.
Hill & Griffith Co., Cincinnati, O.
Paxson, J. W., Co., Philadelphia, Pa.

Core Machines (See also Foundry Supplies).
Detroit Foundry Supply Co., Detroit, Mich.
Nicholls, W. H., New York.
Pangborn, Thomas W., Company, New York.

Core Ovens (See also Foundry Supplies).
Detroit Foundry Supply Co., Detroit, Mich.
Gehnrich, Hermann, New York.
Hill & Griffith Co., Cincinnati, O.
Monarch Eng. & Mfg. Co., Baltimore, Md.
Nicholls, Wm. H., New York.
Pangborn, Thomas W., Company, New York.
Paxson, J. W., Co., Philadelphia, Pa.
Rockwell Furnace Co., New York.
Smith, J. D., Foundry & Supply Co., Cleveland, O.
Stevens, Frederic B., Detroit, Mich.

Core Tapering Machines (See also Foundry Supplies).
Detroit Foundry Supply Co., Detroit, Mich.
Nicholls, Wm. H., New York.
Pangborn, Thomas W., Company, New York.

Cranes.
Detroit Foundry Supply Co., Detroit, Mich.

Crucibles, Stirrers, Stoppers, Nozzles, Etc. (See also Foundry Supplies).
Bartley, Jonathan, Crucible Co., Trenton, N. J.
Dixon, Jos., Crucible Co., Jersey City, N. J.
Gautier, J. H., & Co., Jersey City, N. J.
McCullough-Dalzell Crucible Co., Pittsburg, Pa.
Ross-Tacony Crucible Co., Philadelphia, Pa.
Taylor, R. J., Inc., Philadelphia, Pa.

Crushers, Cinder (See also Foundry Supplies).
Detroit Foundry Supply Co., Detroit, Mich.
Farrel Foundry & Machine Co., Ansonia, Conn.
Moussette, O. J., Co., Brooklyn, N. Y.
Nicholls, Wm. H., New York.
Osborn Mfg. Co., Cleveland, O.
Paxson, J. W., Co., Philadelphia, Pa.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Cupror Metal.
Cupror Co., The, New York.

Cyanide of Potassium (See also Platers' Supplies).
McKesson & Robbins, New York.

Dies, Sheet Metal Working
Baird Machine Co., Oakville, Conn.
Bliss, E. W., Co., Brooklyn, N. Y.
Globe Machine Stamping Co., Cleveland, O.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Draw Benches—Wire, Rod and Tube
Farrel Foundry & Machine Co., Ansonia, Conn.
Oliver, W. W., Mfg. Co., Buffalo, N. Y.
Torrington Mfg. Co., Torrington, Mass.
Waterbury (Conn.) Farrel Foundry & Machine Co.
Watson-Stillman Co., New Yerk.
Wood, R. D., & Co., Philadelphia, Pa.

Drosses (See Metal Turnings, Drosses, etc.).

Drying-Out Machines.
Baird Machine Co., Oakville, Conn.
Smith & Richardson, Attleboro, Mass.
Tolhurst Machine Works, Troy, N. Y.
Torrington Mfg. Co., Torrington, Mass.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Dust Collectors and Ventilating Systems.
Cleveland Blow Pipe & Mfg. Co., Cleveland, O.
Kirk & Blum, Cincinnati, O.
Knickerbocker Co., The, Jackson, Mich.
Pangborn, Thomas W., Company, New York.

Dynamos, Platers' and Galvanizers' (See also Platers' Supplies).
Backus & Lesser Co., New York.
Bennett-O'Connell Co., Chicago, Ill.
Bogue, Chas. J., Electric Co., New York.
Canning, W. Co., Birmingham, England.
Connecticut Dynamo & Motor Co., Irvington, N. J.
Hanson & Van Winkle Co., Newark, N. J.
Nunning-Loeb Co., Matawan, N. J.
L'Hommedieu, C. L., & Sons, Chicago, Ill.
Oliver, W. W., Mfg. Co., Buffalo, N. Y.
U. S. Electric Galvanizing Co., Brooklyn, N. Y.

Electric Cleaning Compounds (See Metal Cleaning Compounds).

Electrodiators' Centrifugal Dryers
Tolhurst Machine Works, Troy, N. Y.

Electroplating, Polishing, Coloring, Etc.
American Toy & Novelty Co., Chicago, Ill.
Northern Ohio Mfg. & Refg. Works, Cleveland, O.
Sargeant Mfg. Co., Newark, N. J.

Emery (See Platers' Supplies).

Emery Wheels (See Grinding Machinery, etc.)

Enameling Ovens.
Gehnrich, Herrmann, New York.
Rockwell Furnace Co., New York.
Steiner, E. E., Newark, N. J.

Engineers, Mechanical, Foundry, Etc.
Pangborn, Thomas W., Company, New York.
Smith, J. D., Foundry Supply Co., Cleveland, O.

Escutcheon Pins, All Metals
Hassall, John, New York.

Etched Name Plates.
Schweizer, Max, Bridgeport, Conn.

Exhaust Fans.
Cleveland Blow Pipe & Mfg. Co., Cleveland, O.
Lederer, F. J., Co., Buffalo, N. Y.
Pangborn, Thomas W., Company, New York.

Expert Instruction—Plating, Coloring, Dipping, Etching, Etc.
Proctor & Stremel, Arlington, N. J.
Schweizer, Max, Bridgeport, Conn.

Extractors, Centrifugal Drying
Tolhurst Machine Works, Troy, N. Y.

Fire Brick (See also Foundry Supplies).
Detroit Foundry Supply Co., Detroit, Mich.
Stevens, Frederic B., Detroit, Mich.

Flasks, Brass Molders' (See also Foundry Supplies).
McPhee, Hugh, Tarrytown, N. Y.
Middleditch, Benj., Detroit, Mich.
Nicholls, W. H., New York.
Osborn Mfg. Co., Cleveland, O.
Sterling Wheelbarrow Co., West Allis, Wis.

Fluxes, Metal (See also Foundry Supplies).
Hill & Griffith Co., Cincinnati, O.
Reeves, Paul S., & Son, Philadelphia, Pa.
Uraniumite Co. of America, Buffalo, N. Y.

Fluxes, Soldering and Tinning
Grasselli Chemical Co., Cleveland, O.
Reeves, Paul S., & Son, Philadelphia, Pa.
Richards & Co., Boston, Mass.

Forgings, Automobile
American Manganese Bronze Co., New York.
Bliss, E. W., Co., Brooklyn, N. Y.

Foundry Facings (See also Foundry Supplies).
Detroit Foundry Supply Co., Detroit, Mich.
Dixon, Jos., Crucible Co., Jersey City, N. J.
Hill & Griffith Co., Cincinnati, O.
McKesson & Robbins, New York.
Paxson, J. W., Co., Philadelphia, Pa.
Stevens, Frederic B., Detroit, Mich.

Foundry Supplies and Equipment.
Birkenstein, S., & Sons, Chicago, Ill.
Detroit Foundry Supply Co., Detroit, Mich.
Fisher, Alfred, Chicago, Ill.
Hawley Down Draft Furnace Co., Chicago, Ill.
Hill & Griffith Co., Cincinnati, O.
Kroschell Bros. Co., Chicago, Ill.
McPhee, Hugh, Tarrytown, N. Y.
Middleditch, Benj., Detroit, Mich.
Monarch Eng. & Mfg. Co., Baltimore, Md.
Nicholls, Wm. H., New York.
Obermayer Co., The S., Cincinnati, O.
Osborn Mfg. Co., Cleveland, O.
Pangborn, Thomas W., Company, New York.
Paxson, J. W., Co., Philadelphia, Pa.
Smith, J. D., Foundry Supply Co., Cleveland, O.
Sterling Wheelbarrow Co., West Allis, Wis.
Stevens, Frederic B., Detroit, Mich.
Uraniumite Co. of America, Buffalo, N. Y.

Furnace Linings (See also Foundry Supplies).
Detroit Foundry Supply Co., Detroit, Mich.
Kroeschell Bros. Co., Chicago, Ill.
Paxson, J. W., Co., Philadelphia, Pa.
Rockwell Furnace Co., New York.
Stevens, Frederic B., Detroit, Mich.

Furnaces, Annealing, Brazing, Etc.
Bates & Peard Annealing Furnace Co., New York.
Detroit Foundry Supply Co., Detroit, Mich.
Fisher, Alfred, Chicago, Ill.
Monarch Eng. Mfg. Co., Baltimore, Md.
Rockwell Furnace Co., New York.
Rockwell, W. S., Co., New York.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Furnaces, Electric
Bristol Co., The, Waterbury, Conn.

Furnaces, Galvanizing and Tinning
Farrel Foundry & Machine Co., Ansonia, Conn.
Monarch Eng. & Mfg. Co., Baltimore, Md.
Rockwell Furnace Co., New York.
Rockwell, W. S., Co., New York.

Furnaces, Melting, for Oil, Coal, Coke, or Gas. (See also Foundry Supplies).
Chicago Flexible Shaft Co., Chicago, Ill.
Detroit Foundry Supply Co., Detroit, Mich.
Fisher, Alfred, Chicago, Ill.
Hawley Down Draft Furnace Co., Chicago, Ill.
Ideal Furnace Co., Chester, Pa.
Kroeschell Bros. Co., Chicago, Ill.
Monarch Eng. & Mfg. Co., Baltimore, Md.
Paxson, J. W., Co., Philadelphia, Pa.
Rockwell Furnace Co., New York.
Rockwell, W. S., Co., New York.

Furnaces, Reverberatory
Rockwell Furnace Co., New York.
Rockwell, W. S., Co., New York.

Fusel Oil, Refined (See also Platers' Supplies).
McKesson & Robbins, New York.
Nikolas, G. J., & Co., Chicago, Ill.

Galvanized Specialties, Nails, Screws, Etc.
U. S. Electro Galvanizing Co., Brooklyn, N. Y.

Galvanizing Plants and Equipment.
(See also Platers' and Polishers' Supplies).
Globe Machine & Stamping Co., Cleveland, O.
Hanson & Van Winkle Co., Newark, N. J.
Meaker Co., Chicago, Ill.

Galvanizing Barrels and Automatic Devices.
U. S. Electro Galvanizing Co., Brooklyn, N. Y.
Globe Machine & Stamping Co., Cleveland, O.

Galvanizing for the Trade.
U. S. Electro Galvanizing Co., Brooklyn, N. Y.

Gas Producers and Power Plants
Wood, R. D., & Co., Philadelphia, Pa.

German Silver Ingots, Castings, Etc.
Reeves, Paul S., & Son, Philadelphia, Pa.
Riverside Metal Co., Riverside, N. J.
Seymour Manufacturing Co., The, Seymour, Conn.

German Silver Sheets, Wire, Rods, Tubes, Etc.
Pilling Bros. Co., Waterbury, Conn.
Reeves, Paul S., & Son, Philadelphia, Pa.
Riverside Metal Co., Riverside, N. J.
Scovill Manufacturing Co., Waterbury, Conn.
Seymour Manufacturing Co., The, Seymour, Conn.
Waterbury Brass Co., Waterbury, Conn.

Gold Alloys.
Riverside Metal Co., Riverside, N. J.

Gold Ingots, Bars, Plates, Etc.
Renziehausen, Wm. F., Co., Newark, N. J.
Riverside Metal Co., Riverside, N. J.

Graphite (See Foundry Supplies).

Grinding Machinery.
Bennett-O'Connell Co., Chicago, Ill.
Blake & Johnson Co., Waterbury, Conn.
Connecticut Dynamo & Motor Co., Irvington, N. J.
Osborn Mfg. Co., Cleveland, O.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Grinding Wheels (See also Foundry Supplies).
Carborundum Co., Niagara Falls, N. Y.

Heat Gages.
Bristol Co., Waterbury, Conn.

Hoists, Electric, Pneumatic, Hand
Detroit Foundry Supply Co., Detroit, Mich.

Hydraulic Accumulators.
Watson-Stillman Co., New York.
Wood, R. D., & Co., Philadelphia, Pa.

Hydraulic Machinery, Presses, Jacks, Etc.
Farrel Foundry & Machine Co., Ansonia, Conn.
Waterbury (Conn.) Farrel Foundry & Machine Co.
Watson-Stillman Co., New York.
Wood, R. D., & Co., Philadelphia, Pa.

Iron, Scrap, Dealers in
Smith, The Morton B., Brooklyn, N. Y.

Iron Tubes, Brass and Bronze Covered
Phoenix Tube Co., Brooklyn, N. Y.

Japanning Ovens.
Gehnrich, Hermann, New York.
Rockwell Furnace Co., New York.
Steiner, E. E., Newark, N. J.

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Jewelers' Equipment and Supplies (See also Platers' Supplies).
Oliver, W. W., Mfg. Co., Buffalo, N. Y.
Tolhurst Machine Works, Troy, N. Y.

Jewelers' Findings.
Smith & Richardson, Attleboro, Mass.

Kettles, Galvanizing and Tinning (See also Platers' Supplies).
Farrel Foundry & Machine Co., Ansonia, Conn.

Lacquer Enamels. (See also Platers' Supplies).
Celluloid Zapon Co., New York.
Egyptian Lacquer Mfg. Co., New York.
Eureka Pneumatic Spray Co., New York.
Hanson & Van Winkle Co., Newark, N. J.

Lacquering Ovens.
Gehnrich, Hermann, New York.
Steiner, E. E., Newark, N. J.

Lacquer Sprayers.
Eclipse Air Brush & Compressor Co., Bloomfield, N. J.
Eureka Pneumatic Spray Co., New York.
Lederer, F. J., Co., Buffalo, N. Y.
Paasche Air Brush Co., Chicago, Ill.

Lacquers, Metal (See also Platers' Supplies).
American Lacquer Co., Bridgeport, Conn.
Celluloid Zapon Co., New York.
Chemical Products Co., Boston, Mass.
Egyptian Lacquer Manufacturing Co., New York.
Eureka Pneumatic Spray Co., New York.
General Bakelite Co., New York.
Hanson & Van Winkle Co., Newark, N. J.
Kalbfleisch, Franklin H., Co., New York.
Munning-Loeb Co., Matawan, N. J.
New Era Lustre Co., New Haven, Conn.
Nikolas, G. J., & Co., Chicago, Ill.

Ladle Heaters and Dryers (See also Foundry Supplies).
Detroit Foundry Supply Co., Detroit, Mich.
Hawley Down Draft Furnace Co., Chicago, Ill.
Monarch Eng. & Mfg. Co., Baltimore, Md.
Pangborn, Thomas W., Co., Baltimore, Md.
Paxson, J. W., Co., Philadelphia, Pa.
Rockwell Furnace Co., New York.

Ladles (See also Foundry Supplies).
Detroit Foundry Supply Co., Detroit, Mich.

Lathes, Polishing (See Platers' and Polishers' Supplies).

Lathes, Spinning, Turning, Etc.
American Tool & Machine Co., Boston, Mass.
Bliss, E. W., Co., Brooklyn, N. Y.
Oliver, W. W., Mfg. Co., Buffalo, N. Y.
Pryibil, P., New York.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Lathes, Turret
American Tool & Machine Co., Boston, Mass.

Lead, Antimonial
Leavitt, C. W., & Co., New York.
Michigan Smelting & Refining Co., Detroit, Mich.
Richards & Co., Boston, Mass.
Standard Rolling Mills, Inc., Brooklyn, N. Y.

Lead Castings, Antimonial
Standard Rolling Mills, Inc., Brooklyn, N. Y.

Lead, Pig and Bar
American Smelting & Refining Co., Cincinnati, O.
Birkenstein, S., & Sons, Chicago, Ill.
Hendricks Bros., New York.
Illinois Smelting & Refining Co., Chicago, Ill.
Merchant & Evans Co., Philadelphia, Pa.
Michigan Smelting & Refining Co., Detroit, Mich.
National Metal Reduction Co., Cleveland, O.
Richards & Co., Boston, Mass.
Standard Rolling Mills, Inc., Brooklyn, N. Y.
U. S. Reduction Co., Chicago, Ill.

Lead Pipe.
North American Smelting Co., Philadelphia, Pa.

Leather Meal for Dry Tumbling.
Peckham Mfg. Co., Newark, N. J.

Lubricants.
Dixon, Joseph, Crucible Co., Jersey City, N. J.

Lycopodium (See also Foundry Supplies).
McKesson & Robbins, New York.

Manganese Bronze Ingots and Castings.
Ajax Metal Co., Philadelphia, Pa.
Allan, A., & Son, New York.
American Manganese Bronze Co., New York.
Clum & Atkinson, Rochester, N. Y.
Electric Smelting & Refining Co., Detroit, Mich.
North American Smelting Co., Philadelphia, Pa.
Reeves, Paul S., & Son, Philadelphia, Pa.
Richards & Co., Boston, Mass.
Riverside Metal Co., Riverside, N. J.
Taunton-New B'fd Copper Co., New Bedford, Mass.

Manganese Bronze Sheets, Rods, Etc.
American Manganese Bronze Co., New York.
Taunton-New B'fd Copper Co., New Bedford, Mass.

Manganese Copper.
American Smelting & Refining Co., Cincinnati, O.
Electric Semlting & Alum. Co., Lockport, N. Y.
Reeves, Paul S., & Sons, Philadelphia, Pa.
Riverside Metal Co., Riverside, N. J.
Roessler & Hasslacher Chemical Co., New York.

Manganese Metal.
Leavitt, C. W., & Co., New York.
Reeves, Paul S., & Son, Philadelphia, Pa.
Roessler & Hasslacher Chemical Co., New York.

Magnesium Metal.
Leavitt, C. W., & Co., New York.
McKesson & Robbins, New York.
Roessler & Hasslacher Chemical Co., New York.

Magnetic Metal Separators (See also Foundry Supplies).
American Concentrator Co., Joplin, Mo.
Capitol Brass Works, Detroit, Mich.
Dings Electro-Mag. Separator Co., Milwaukee, Wis.
Pangborn, Thomas W., Company, New York.

Match Plates
McPhee, Hugh, Tarrytown, N. Y.
Middleditch, Benj., Detroit, Mich.

Metals (See name of metal wanted).

Metal Cleaning Compounds (See also Platers' Supplies).
Anthony, H. M., & Co., New York.
Cleveland Platers' Supply Co., Cleveland, O.
Electric Smelt. & Aluminum Co., Lockport, N. Y.
Hanson & Van Winkle Co., Newark, N. J.
International Chemical Co., Camden, N. J.
Stevens, Frederic B., Detroit, Mich.
Swan & Finch Co., New York.

Metal Fluxes (See also Foundry Supplies).
Reeves, Paul S., & Son, Philadelphia, Pa.
Uraniumite Co. of America, Buffalo, N. Y.

Metallurgists, Consulting.
Detroit Testing Laboratory, Detroit, Mich.
Krom, L. J., New York.
Ledoux & Co., New York.

Metals, Dealers in all Kinds of New (See also name of metal wanted).
Andler, M. M., & Co., Boston, Mass.
Birkenstein, S., & Sons, Chicago, Ill.
Merchant & Evans Co., Philadelphia, Pa.
Moers, Albert A., New York.
Richards & Co., Boston, Mass.

Metals, Dealers in Old
Andler, M. M., & Co., Boston, Mass.
Birkenstein, S., & Sons, Chicago, Ill.
Genesee Metal Co., Rochester, N. Y.
Illinois Smelting & Refining Co., Chicago, Ill.
Smith, The Morton B. Co., New York.
Riverside Metal Co., Riverside, N. J.

Metals, Dealers in Old—Gold, Silver, Platinum
Renziehausen, Wm. F., Co., Newark, N. J.
Riverside Metal Co., Riverside, N. J.

Metal Goods Drying Machines
Tolhurst Machine Works, Troy, N. Y.

Metal Goods Made to Order.
Aluminum Goods Mfg. Co., Manitowoc, Wis.
American Toy & Novelty Co., Chicago, Ill.
Ansonia Brass & Copper Co., New York.
Bridgeport Brass Co., Bridgeport, Conn.
Manhattan Brass Co., New York.
Riverside Metal Co., Riverside, N. J.
Sargeant Mfg. Co., Newark, N. J.
Scovil Manufacturing Co., Waterbury, Conn.
Waterbury Brass Co., Waterbury, Conn.

Metal, Plated Sheet
Benson, H. K. & F. S., Glen Ridge, N. J.
National Sheet Metal Co., Peru, Ill.

Metal Refiners, Gold and Silver.
Genesee Metal Co., Rochester, N. Y.
Renziehausen, Wm. F., Co., Newark, N. J.
Riverside Metal Co., Riverside, N. J.

Metal Refiners—White Metal.
Birkenstein, S., & Sons, Chicago, Ill.
Michigan Smelting & Refining Co., Detroit, Mich.
National Metal Reduction Co., Cleveland, O.
Reeves, Paul S., & Sons, Philadelphia, Pa.
Standard Rolling Mills, Inc., Brooklyn, N. Y.
Toothill, John, Rochelle Park, N. J.

Metal, Silver Plated Sheet
Benson, H. K. & F. S., Glen Ridge, N. J.

Metal Spinning. (See also Metal Goods made to order).
Aluminum Goods Mfg. Co., Manitowoc, Wis.
Riverside Metal Co., Riverside, N. J.
Standard Rolling Mills, Inc., Brooklyn, N. Y.

Metal Stamping. (See also Metal Goods made to order).
Aluminum Goods Mfg. Co., Manitowoc, Wis.
Globe Machine & Stamping Co., Cleveland, O.
Riverside Metal Co., Riverside, N. J.
Standard Rolling Mills, Inc., Brooklyn, N. Y.

Metal Turnings, Drosses Residue, Etc., Buyers of
Andler, M. M., Co., Boston, Mass.
Birkenstein, S., & Sons, Chicago, Ill.
Illinois Smelting & Refining Co., Chicago, Ill.
Smith, The Morton B., Co., New York.
Toothill, John, Rochelle Park, N. J.
Whipple & Choate, Bridgeport, Conn.
White & Bro., Inc., Philadelphia, Pa.

Mold Dryers, Portable (See also Foundry Supplies).
Detroit Foundry Supply Co., Detroit, Mich.
Monarch Eng. & Mfg. Co., Baltimore, Md.
Pangborn, Thomas W., Company, New York.
Paxson, J. W., Co., Philadelphia, Pa.
Rockwell Furnace Co., New York.

Mold Spraying Machines. (See also Foundry Supplies).
Pangborn, Thomas W., Company, New York.

Molds, Ingot (See also Foundry Supplies).
Farrel Foundry & Machine Co., Ansonia, Conn.
Nicholls, Wm. H., New York.
Paxson, J. W., Co., Philadelphia, Pa.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Molding Machines. (See also Foundry Supplies).
Detroit Foundry Supply Co., Detroit, Mich.
Hill & Griffith Co., Cincinnati, O.
McPhee, Hugh, Tarrytown, N. Y.
Nicholls, Wm. H., New York.
Osborn Mfg. Co., Cleveland, O.
Paxson, J. W., Co., Philadelphia, Pa.
Turner Machine Co., Philadelphia, Pa.

Monel Metal Sheets.
Merchant & Evans Co., Philadelphia, Pa.

Muntz's Metal—Sheets, Rods, Bolts, Nails, Etc.
Taunton-New B'fd Copper Co., New Bedford, Mass.

Nails. (See name of metal wanted).

Name Plates, Etched
Schweizer, Max, Bridgeport, Conn.

Nickel.
Hanson & Van Winkle Co., Newark, N. J.
Hendricks Bros., New York.
Leavitt, C. W., & Co., New York.
Merchant & Evans Co., Philadelphia, Pa.
Richards & Co., Boston, Mass.

Nickel Castings.
Hanson & Van Winkle Co., Newark, N. J.

Nickel Salts. (See also Platers' Supplies).
Detroit Foundry Supply Co., Detroit, Mich.
Hanson & Van Winkle Co., Newark, N. J.
McKesson & Robbins, New York.
Munning-Loeb Co., Matawan, N. J.

Nickel, Shot
Merchant & Evans Co., Philadelphia, Pa.
Seymour Manufacturing Co., The, Seymour, Conn.

Nickel Silver Tubes.
Wells, A. H., & Co., Waterbury, Conn.

Oil Pumps and Storage Tanks.
Monarch Eng. & Mfg. Co., Baltimore, Md.
Rockwell Furnace Co., New York.

Oils, Tempering and Lubricating
McKesson & Robbins, New York.
Swan & Finch, New York.

Ovens. (See also Core, Lacquering, Enameling and Sherardizing Ovens).
Gehnrich, Hermann, New York.
Steiner, E. E., Newark, N. J.

Paint for Metals, Etc.
Woolsey, C. A., Co., Jersey City, N. J.

Parting Compounds. (See also Foundry Supplies)
Detroit Foundry Supply Co., Detroit, Mich.
Hill & Griffith Co., Cincinnati, O.
Stevens, Frederic B., Detroit, Mich.

Pattern Shop Supplies (See Foundry Supplies).

Patterns, Mounted
McPhee, Hugh, Tarrytown, N. Y.

Pewter.
Standard Rolling Mills, Inc., Brooklyn, N. Y.

Phosphor Bronze Ingots, Castings, Etc.
Ajax Metal Co., Philadelphia, Pa.
Allan, A., & Son, New York.
Clum & Atkinson, Rochester, N. Y.
Damascus Bronze Co., Pittsburg, Pa.
Illinois Smelting & Refining Co., Chicago, Ill.
Michigan Smelting & Refining Co., Detroit, Mich.
Phosphor Bronze Smelting Co., Philadelphia, Pa.
Reeves, Paul S., & Son, Philadelphia, Pa.
Riverside Metal Co., Riverside, N. J.
Seymour Mfg. Co., Seymour, Conn.

Phosphor Bronze Sheets, Wire, Rods, Etc.
Phosphor Bronze Smelting Co., Philadelphia, Pa.
Pilling Brass Co., Waterbury, Conn.
Reeves, Paul S., & Son, Philadelphia, Pa.
Riverside Metal Co., Riverside, N. J.
Seymour Mfg. Co., Seymour, Conn.

Phosphor Copper.
American Smelting & Refining Co., Cincinnati, O.
Electric Smelt. & Aluminum Co., Lockport, N. Y.
Michigan Smelting & Refining Co., Detroit, Mich.
North American Smelting Co., Philadelphia, Pa.
Reeves, Paul S., & Son, Philadelphia, Pa.
Richards & Co., Boston, Mass.
Riverside Metal Co., Riverdale, N. J.
Roessler & Hasslacher Chemical Co., New York.

Phosphor Tin.
American Smelting & Refining Co., Cincinnati, O.
Damascus Bronze Co., Pittsburg, Pa.
Electric Smelt. & Aluminum Co., Lockport, N. Y.
Clum & Atkinson, Rochester, N. Y.
North American Smelting Co., Philadelphia, Pa.
Reeves, Paul S., & Son, Philadelphia, Pa.
Richards & Co., Boston, Mass.

Phosphorus. (See also Foundry Supplies).
General Chemical Co., Philadelphia, Pa.
McKesson & Robbins, New York.

Pickling Machines, Automatic
Schmitz, August, Dusseldorf, Germany.
Torrington Manufacturing Co., Torrington, Conn.

Platers' Compound. (See also Platers' Supplies).
International Chemical Co., Camden, N. J.
Swan & Finch Co., New York.

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Platers' Metal (See also Platers' Supplies).
Kemp, W. H., New York.
Pilling Brass Co., Waterbury, Conn.

Platers', Polishers' and Galvanizers' Equipment and Supplies.
Abbott Ball Co., Hartford, Conn.
Anthony, H. M., Co., New York.
Automatic Buffing Machine Co., Buffalo, N. Y.
Backus & Leeser Co., New York.
Baird Machine Co., Oakville, Conn.
Bennett-O'Connell Co., Chicago, Ill.
Burns, E. Reed, Brooklyn, N. Y.
Canning, W., & Co., Birmingham, England.
Chemical Products Co., Boston, Mass.
Cleveland Platers' Supply Co., Cleveland, O.
Connecticut Dynamo & Motor Co., Irvington, N. J.
Detroit Foundry Supply Co., Detroit, Mich.
Divine Bros. Co., Utica, N. Y.
General Bakelite Co., New York.
Globe Machine & Stamping Co., Cleveland, O.
Grassell Chemical Co., Cleveland, O.
Hanson & Van Winkle Co., Newark, N. J.
International Chemical Co., Camden, N. J.
Klauder-Weldon Dy'g Mach. Co., Amsterdam, N. Y.
L'Hommedieu, C. F., & Sons, Chicago, Ill.
Meaker Company, Chicago, Ill.
McKesson & Robbins, New York.
Moyer, D. B., Walled Lake, Mich.
Munning-Loeb Co., Matawan, N. J.
Peckham Mfg. Co., Newark, N. J.
Roessler & Hasslacher Chemical Co., New York.
Rockhill & Vietor, New York.
Roth Bros. Co., Chicago, Ill.
Smith & Richardson, Attleboro, Mass.
Stevens, Frederic B., Detroit, Mich.
Swan & Finch Co., New York.
Tolhurst Machine Works, Troy, N. Y.

Plating Barrels and Apparatus.
(See also Platers' Supplies).
Abbott Ball Co., Hartford, Conn.
Backus & Leeser Co., New York.
Baird Machine Co., Oakville, Conn.
Bennett-O'Connell Co., Chicago, Ill.
Connecticut Dynamo & Motor Co., Irvington, N. J.
Detroit Foundry Supply Co., Detroit, Mich.
Globe Machine & Stamping Co., Cleveland, O.
Hanson & Van Winkle Co., Newark, N. J.
L'Hommedieu, C. F., & Sons Co., Chicago, Ill.
Klauder-Weldon Dy'g Mach. Co., Amsterdam, N. Y.
Manning-Loeb Co., Matawan, N. J.
Rockhill & Vietor, New York.
Smith & Richardson, Attleboro, Mass.
Tolhurst Machine Works, Troy, N. Y.

Platinum Ingots.
Guiterman, Rosenfeld & Co., New York.

Platinum Scrap, Buyers of
Roessler & Hasslacher Co., New York.

Plumbago (See Graphite).

Polishing, Buffing and Burnishing Machinery and Appliances (See also Platers' Supplies).
Abbott Ball Co., Hartford, Conn.
Automatic Buffing Machine Co., Buffalo, N. Y.
Backus & Leeser Co., New York.
Baird Machine Co., Oakville, Conn.
Bennett-O'Connell Co., Chicago, Ill.
Cleveland Blow Pipe Co., Cleveland, O.
Cleveland Platers' Supply Co., Cleveland, O.
Connecticut Dynamo & Motor Co., Irvington, N. J.
Detroit Foundry Supply Co., Detroit, Mich.
Divine Bros. Co., Utica, N. Y.
Globe Machine & Stamping Co., Cleveland, O.
Hanson & Van Winkle Co., Newark, N. J.
Kirk & Blum, Cincinnati, O.
Knickerbocker Co., Jackson, Mich.
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Moyer, D. B., Walled Lake, Mich.
Munning-Loeb Co., Matawan, N. J.
Oliver, W. W., Mfg. Co., Buffalo, N. Y.
Osborn Mfg. Co., Cleveland, O.
Peckham Mfg. Co., Newark, N. J.
Pfleghar Hardware Sp'lty Co., New Haven, Conn.
Roth Bros., Chicago, Ill.
Tolhurst Machine Works, Troy, N. Y.

Polishing Belts, Endless (See also Platers' Supplies).
Ames Sword Co., Chicopee, Mass.

Polishing Meal for Dry Tumbling
Peckham Mfg. Co., Newark, N. J.

Potash. (See also Platers' Supplies).
International Chemical Co., Camden, N. J.
McKesson & Robbins, New York.
Niagara Alkali Co., Niagara Falls, N. Y.

Presses, Bench and Foot
Baird Machine Co., Oakville, Conn.
Blake & Johnson Co., Waterbury, Conn.
Bliss, E. W., Company, Brooklyn, N. Y.
Shuster, The F. B., Co., New Haven, Conn.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Presses, Cabbaging
Farrel Foundry & Machine Co., Ansonia, Conn.
Waterbury (Conn.) Farrel Foundry & Machine Co.
Wood, R. D., & Co., Philadelphia, Pa.

Presses, Coining
Bliss, E. W., Co., Brooklyn, N. Y.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Presses, Drop
Bliss, E. W., & Co., Brooklyn, N. Y.
Oliver, W. W., Mfg. Co., Buffalo, N. Y.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Presses, Power
Baird Machine Co., Oakville, Conn.
Blake & Johnson Co., Waterbury, Conn.
Bliss, E. W., Co., Brooklyn, N. Y.
Farrel Foundry & Machine Co., Ansonia, Conn.
Garrison, A., Foundry Co., Pittsburg, Pa.
Torrington Manufacturing Co., Torrington, Conn.
Waterbury (Conn.) Farrel Foundry & Machine Co.
Watson-Stillman Co., New York.
Wood, R. D., & Co., Philadelphia, Pa.

Pressure Blowers. (See also Foundry Supplies).
Eureka Pneumatic Spray Co., New York.
Lederer, F. J., Co., Buffalo, N. Y.
Monarch Eng. Mfg. Co., Baltimore, Md.
Rockwell Furnace Co., New York.

Pyrometers.
Bristol & Co., The, Waterbury, Conn.

Riveting Machines.
Shuster, The F. B., Co., New Haven, Conn.
Wood, R. D., & Co., Philadelphia, Pa.

Rivets—Brass, Aluminum, Etc.
Hassall, John, Inc., New York.
Hendricks Bros., New York.
Kemp, W. H., Co., New York.

Roll-Grinding Machines.
Farrel Foundry & Machine Co., Ansonia, Conn.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Rolls, Chilled and Sand
Blake & Johnson Co., Waterbury, Conn.
Farrel Foundry & Machine Co., Ansonia, Conn.
Garrison, A., Fdy. & Machine Co., Pittsburg, Pa.
Torrington Manufacturing Co., Torrington, Conn.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Rolls, Jewelers'
Oliver, W. W., Mfg. Co., The, Buffalo, N. Y.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Rolling Mill Machinery.
Blake & Johnson Co., Waterbury, Conn.
Farrel Foundry & Machine Co., Ansonia, Conn.
Garrison, A., Fdy. & Machine Co., Pittsburg, Pa.
Oliver, W. W., Mfg. Co., The, Buffalo, N. Y.
Torrington Manufacturing Co., Torrington, Conn.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Rouge. (See Platers' Supplies).

Sand, Fire (See also Foundry Supplies).
Detroit Foundry Supply Co., Detroit, Mich.
Pangborn, Thomas W., Company, New York.
Paxson, J. W., Co., Philadelphia, Pa.

Sand Blast Machinery and Equipment.
Nicholas, Wm. H., New York.
Pangborn, Thomas W., Company, New York.
Paxson, J. W., Co., Philadelphia, Pa.

Sand Blast Systems
Pangborn, Thomas W., Company, New York.

Sand Blast Tumbling Barrels.
Pangborn, Thomas W., Company, New York.

Sand Dryers
Pangborn, Thomas W., Company, New York.

Sand Handling and Conveying Machines
Pangborn, Thomas W., Company, New York.

Sand Dryers, Sifters and Mixers.
(See also Foundry Supplies).
Detroit Foundry Supply Co., Detroit, Mich.
Nicholls, Wm. H., New York.
Osborn Mfg. Co., Cleveland, O.
Pangborn, Thomas W., Company, New York.
Paxson, J. W., Co., Philadelphia, Pa.
Turner Machine Co., Philadelphia, Pa.

Sand, Molding (See also Foundry Supplies).
Detroit Foundry Supply Co., Detroit, Mich.
Pangborn, Thomas W., Company, New York.
Paxson, J. W., Co., Philadelphia, Pa.

Sawdust, Boxwood, for Drying Purposes.
(See also Platers' Supplies).
Sommers, John, Faucet Co., Newark, N. J.

Sawdust Drying-out Boxes.
(See also Platers' Supplies).
Bennett-O'Connell Co., Chicago, Ill.
Hanson & Van Winkle Co., Newark, N. J.
Steiner, E. E., Newark, N. J.

Shears, Power
Bliss, E. W., Co., Brooklyn, N. Y.
Farrel Foundry & Machine Co., Ansonia, Conn.
Garrison, A., Fdy. & Machine Co., Pittsburg, Pa.
Torrington Manufacturing Co., Torrington, Conn.
Waterbury (Conn.) Farrel Foundry & Machine Co.
Watson-Stillman Co., New York.
Wood, R. D., & Co., Philadelphia, Pa.

Sheet Metal Straightening, Cutting and Forming Machinery.
Baird Machine Co., Oakville, Conn.
Bliss, E. W., Co., Brooklyn, N. Y.
Blake & Johnson Co., Waterbury, Conn.
Farrel Foundry & Machine Co., Ansonia, Conn.
Shuster, The F. B., Co., New Haven, Conn.
Torrington Manufacturing Co., Torrington, Conn.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Sheradizing (See also Galvanizing).
Globe Machine & Stamping Co., Cleveland, O.

Sheradizing Ovens
Gehnrich, Hermann, New York.
Globe Machine & Stamping Co., Cleveland, O.
Rockwell Furnace Co., New York.

Silicon.
American Smelting & Refining Co., Cincinnati, O.
Leavitt, C. W., & Co., New York.

Silicon Copper.
American Smelting & Refining Co., Cincinnati, O.
Electric Smelting & Alum'n Co., Lockport, N. Y.
Roessler & Hasslacher Chemical Co., New York.

Silver, Nitrate and Chloride of
(See also Platers' Supplies).
Jackson, John J., Co., Newark, N. J.

Silver Ingots, Bars, Plates, Etc.
Renziehausen, Wm. F., Co., Newark, N. J.

Silver, Rolled Sterling
Jackson, John J., Co., Newark, N. J.
Renziehausen, Wm. F., Co., Newark, N. J.
Riverside Metal Co., Riverside, N. J.

Silver Wire.
Jackson, John J., Co., Newark, N. J.

Smelters, Sweep
Renziehausen, W. F., Co., Newark, N. J.

Soap. (See also Platers' Supplies).
International Chemical Co., Camden, N. J.

Solder, Aluminum
Aluminum Company of America, Pittsburg, Pa.
American Solder Co., Boston, Mass.
Clum & Atkinson, Rochester, N. Y.
Electric Smelt. & Aluminum Co., Lockport, N. Y.
Janney, Steinmetz & Co., Philadelphia, Pa.
Kemp, W. H., Co., New York.
Richards & Co., Boston, Mass.
U. S. Reduction Co., Chicago, Ill.

Solder, Brazing
American Smelting & Refining Co., Cincinnati, O.
Hussey, C. G., & Co., Pittsburg, Pa.
Linton & Co., Providence, R. I.
Merchant & Evans Co., Philadelphia, Pa.
National Metal Reduction Co., Cleveland, O.
Naulty Smelting & Ref'g Co., Philadelphia, Pa.
North American Smelting Co., Philadelphia, Pa.
Richards & Co., Boston, Mass.
Shimer, H. M., & Co., Philadelphia, Pa.

Solder, Gold
Linton & Co., Providence, R. I.

Solder, Silver
Jackson, John J., & Co., Newark, N. J.
Linton & Co., Providence, R. I.

Solder, Tinners'
American Smelting & Refining Co., Cincinnati.
Merchant & Evans Co., Philadelphia, Pa.
Michigan Smelting & Refining Co., Detroit, Mich.
National Metal Reduction Co., Cleveland, O.
North American Smelting Co., Philadelphia, Pa.
Richards & Co., Boston, Mass.

Spelter.
American Smelting & Refining Co., Cincinnati, O.
Birkenstein, S., & Sons, Chicago, Ill.
Grasselli Chemical Co., Cleveland, O.
Hegeler Bros., Danville, Ill.
Hendricks Bros., New York.
Illinois Smelting & Refining Co., Chicago, Ill.
Illinois Zinc Co., Peru, Ill.
Leavitt, C. W., & Co., New York.
Matthiessen & Hegeler Zinc Co., La Salle, Ill.
Michigan Smelting & Refining Co., Detroit, Mich.
National Metal Reduction Co., Cleveland, O.
New Jersey Zinc Co., The, New York.
Richards & Co., Boston, Mass.
Sandoval Zinc Co., Chicago, Ill.
U. S. Reduction Co., Chicago, Ill.
Vogelstein, L., & Co., New York.

Spinning Lathes.
Bliss, E. W., Company, Brooklyn, N. Y.
Pryibil, P., New York.

Spraying Machines.
Eclipse Air Brush & Compressor Co., Bloomfield, N. J.
Eureka Pneumatic Spray Co., New York.
Lederer, F. J., Co., Buffalo, N. Y.
Paasche Air Brush Co., Chicago, Ill.
Pangborn, Thomas W., Company, New York.

Sprue Cutters. (See also oFundry Supplies).
Bliss, E. W., Company, Brooklyn, N. Y.
Middleditch, Benj., Detroit, Mich.
Nicholls, Wm. H., New York.
Shuster, The F. B., Company, New Haven, Conn.
Smith, J. D., Foundry Supply Co., Cleveland, O.
Turner Machine Co., Philadelphia, Pa.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Tacks, (See name of metal wanted).

Tanks, Electroplaters' (See also Platers' Supplies).
Chadwick-Boston Lead Co., Boston, Mass.
Corcoran, A. J., Inc., New York.
Hanson & Van Winkle Co., Newark, N. J.
Stearns, The A. T., Lumber Co., Boston, Mass.

Tin, Chloride of
Grasselli Chemical Co., Cleveland, O.

Tinning Machines
Globe Machine & Stamping Co., Cleveland, O.
U. S. Electro Galvanizing Co., Brooklyn, N. Y.

Tin, Pig, Bar and Block
American Smelting & Refining Co., Cincinnati, O
Birkenstein, S., & Sons, Chicago, Ill.
Hendricks Bros., New York.
Leavitt, C. W., & Co., New York.